



Motivation as a Function of Expectancy and Incentive

5

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5.1 The Emergence of Incentives as Explanatory Concepts

Like Chap. 4, this chapter deals with the situational determinants of behavior. All of the theories to be discussed assume that the organism is able to anticipate events and that behavior is guided by anticipatory goal states. The underlying assumption is that goal states are involved in the “reinforcement” of behavior. When our actions meet with success, the respective goal states are associated with positive affect. When we fail, or in the case of negative reinforcement, they are associated with negative affect. The anticipation of the affect associated with goal states activates a behavioral tendency to either approach or avoid specific goal states. Situational stimuli that alert the organism to affectively charged goal states are known as incentives. Hence, the present chapter deals with incentive theories of motivation.

The striving for affectively charged goal states is a core component of motivation. There are evidently two preconditions for this striving. First, it

must be possible to anticipate the occurrence of the goal state; there must be an expectation. Second, the goal state must have some subjective significance or value for the organism.

- Incentive theories of motivation assume that behavior is goal directed. Its regulation is forward looking, as though the organism were constantly asking itself what leads to what. Behavior is proactive and is attracted to future goal states by the incentive-like promises and threats of the present situation.

The explanatory models covered in Chap. 4, such as Hull’s (1943) reinforcement theory, are rather reactive by comparison. Here, the general energizing of behavior is attributed to a nonspecific drive, and behavior is assumed to be guided by previously established stimulus-response bonds (habits).

Preliminary conceptualizations of incentive theories are found, in one form or another, in the work of the pioneers of motivation research, such as William James, Freud, and McDougall. The first theory of motivation in which the idea of incentives not only plays a central role but is also developed systematically is Lewin’s field theory. Within his model of the psychological environment, Lewin tried to define the effects of incentives – or, to use his terminology, valences – on behavior.

For Tolman, “expectancy” and “demand for the goal” became the hypothetical constructs of a

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“psychological behaviorism.” These intervening cognitions mediate between the situation and the subsequent behavior. Tolman felt the assumption of rigid, learned stimulus-response bonds (“habits”) in Hull’s reinforcement theory to be inappropriate for explaining the flexible goal orientation of behavior. Based largely on his experimental findings on latent learning, Tolman was able to draw a distinction between learning and motivation (performance). Reinforcement of behavior has less effect on learning as such than on whether what has been learned is actually put into practice. According to Tolman, reinforcement generates the expectation of an event with incentive character.

The proponents of reinforcement theory, Hull and his students, incorporated Tolman’s findings in their work, leading to a gradual transformation of reinforcement theory into an incentive theory of motivation. This applied particularly to Spence (1956) and, even more so, to Mowrer (1960), who used incentives to explain everything that had previously been attributed to drives.

This move toward an incentive-oriented approach further raised the question of whether response reinforcement might not be a superfluous or even inadequate explanation for operant learning. Might it not be better to explain the reinforcer’s impact on behavior as a motivational incentive effect rather than as an effect related to the linkage between stimulus and response? This is a position long held by many well-known theorists in learning and motivation, e.g., Walker (1969), Bolles (1972), and Bindra (1974). Theoretical models that expand on Tolman’s approaches suggest that it is not stimulus-response bonds that are learned but expectations of contingencies. According to Bolles there are two basic types of expectations:

- Situation-consequence contingencies ($S-S^*$)
- Response-consequence contingencies ($R-S^*$)

This results in a simple cognitive model of motivation. The probability of a response increases as a function of the strength of $S-S^*$ and of $R-S^*$ and with the value of S^* . In other words, motivation is a function of expectancy and value.

The 1940s and 1950s saw the development of theoretical models incorporating expectancy and incentive beyond the confines of learning theory. These “expectancy-value theories” were invoked to explain decision-making behavior in situations ranging from placing bets in a game of chance to purchasing decisions (Edwards, 1954; von Neumann & Morgenstern, 1944) or setting levels of aspiration for tasks of varying difficulty levels (Atkinson, 1957; Escalona, 1940; Festinger, 1942).

- Expectancy-value theory states that, when several action alternatives are available, the one with the highest product of attainable value (incentive) times probability of success (expectancy) will be chosen. In other words, the individual strives for a goal state with the highest possible incentive value, taking into account the probability of its attainment. Expectancy-value theories form an important basis for contemporary motivation research.

Before examining the expectancy-value theories that are paradigmatic of today’s motivation research, we will consider the foundations of these theories, starting with the concepts of incentive and expectancy and then discussing Kurt Lewin’s conceptualizations. The latter provided an extremely fertile ground for contemporary theorizing.

5.2 Situational Parameters of Motivation

Behaviorist learning theory assumes the situations in which individuals find themselves to play a crucial role in energizing and directing behavior. Situational stimuli alert people to goal states that have incentive value for themselves personally. They also provide information permitting individuals to gauge the probability of attaining these goal states. In other words, situations contain stimuli that lead to subjective representations of incentive and expectancy. These subjective representations are not independent of person factors.

5.2.1 The Incentive Concept

Definition

The incentive construct describes situational stimuli that are capable of eliciting a motivational state. Affective responses constituting a fundamental (basal) evaluation are at the core of this construct.

A stimulus can acquire incentive character over the course of an individual's learning history through its association with affect. A ski slope, for example, can trigger positive affective responses, such as pleasure and excitement, in one person, but negative responses, such as fear, in another. These responses depend on the individual's previous experience – in this case, associated with skiing. Learning, however, does not always seem to be a necessary precondition for an object to acquire incentive value. For example, a taste can activate specific receptors for sweet substances, which then trigger specific behaviors without the need for having had any prior experience of the foodstuff in question (Pfaffmann, 1982).

Affect, in its function as a primary evaluative mechanism, is an integral component of the incentive concept. For Schmalt (1996, p. 245), incentives are nothing more than anticipated affect. An object associated with positive affect has positive incentive value; an object associated with negative affect has negative incentive value. Modern research assumes that positive and negative affects are two mutually independent events (Watson & Tellegen, 1985), meaning that it is possible for strong positive and strong negative affect to occur at the same time.

- Crucially, incentives do not describe objective states but subjective phenomena as perceived and affectively evaluated by the individual.

Particular objects or events that represent or are associated with the goal state, or that threaten to frustrate it, have positive or negative salience. These objects or events (S^*) represent a corresponding positive or negative incentive. They attract or repel the organism. Everything

that has “reinforcement qualities,” i.e., that can be shown to affect the antecedent behavior, can be attributed incentives. Incentives, like expectancies, are hypothetical constructs, and motivation theorists employ them to differing extents. In particular, their theoretical explanations of the conditions that give rise to incentives differ. The incentive value of objects or events may be seen as learned or innate (independent of experience) and as more or less dependent on momentary need states. Other terms used to designate this value character are valence (Lewin) and demand for the goal (Tolman).

Perceived or expected objects and events that have incentive character elicit behavior as well as giving it direction. Incentives are assumed to both energize and guide behavior by eliciting and attracting it across space and time.

The association of objects with affects, which endows stimuli with incentive character, occurs at early stages of processing in the limbic system. The amygdala plays a key role in generating affect, the nucleus accumbens is central in mediating motivational effects including reinforcement, and the prefrontal cortex helps to facilitate action (Wise & Rompré, 1989).

Leaving behind Hull's reinforcement theory, Milner (1970) defined incentives as the mechanisms that trigger behavior in the absence of a biological “drive.” More recent research findings indicate that this triggering effect is not independent of the organismic state.

Organismic states influence the effect or salience of incentives. Toates (1986) suggested that organismic states can function as mediators that increase or diminish the salience of incentives, depending on whether excitatory or inhibitory influences predominate. Neuropsychological research has confirmed this assumption, showing that the salience of incentives is a function of the motivational state communicated by the central nervous dopamine system (Berridge & Robinson, 1998). It would seem that dopamine triggers desires and aspirations that can prompt an active search for cue stimuli. It does not have an impact on affective quality, however, i.e., how much we like something. This explains why we are more likely to notice food when we are hungry and why – although the range

of foods we consider palatable increases as our hunger grows – we would not be any happier to be served a worm for breakfast.

Schneider and Schmalz (1994, p. 16, own translation) see motives and incentives as closely related: “Situational incentives reflect the specific motive goals that people can aspire to or seek to avoid. Motives, in contrast, reflect evaluative dispositions for classes of these goals, the strength of which differs interindividually.” In the following, we will show that the first formulations of incentive theories (e.g., Lewin’s field theory) were in fact motivation theories without motives, i.e., that they disregarded enduring individual dispositions.

5.2.2 The Expectancy Concept

Another situational determinant of motivation is expectancy, i.e., the perceived probability that a certain goal state will ensue from a situation. This may entail the need for action or occur without the individual’s involvement. Like incentive, expectancy is a subjective quality that develops over the course of the individual’s learning history (see the overview and Fig. 1.2 in Chap. 1).

Characteristics of the “Expectancy” Variable

1. *Expectations of the situation-consequence contingency type (S–S*)*, cf. Bolles, 1972): This type of expectation consists simply in the anticipation of a specific goal state, independent of the organism’s own behavior (as in classical conditioning, where a signal precedes the presentation of food).
2. *Expectations of the response-consequence contingency type (R–S*)*: This type of expectation entails the need for action on the part of the organism.
3. Expectations can also be differentiated on the basis of the amount of time or the number of behavioral sequences they encompass.
4. Expectations are not directly observable. They must be inferred and therefore represent hypothetical constructs.

Theories of motivation differ in the extent to which they take the last point in the overview into account, i.e., in how well they are able to interpret the role of expectations as hypothetical constructs that can be used to predict outcomes on the basis of previous learning.

5.3 Linking Incentive and Expectancy

The French philosopher Blaise Pascal (1623–1662) was the first to link the constructs of value (incentive) and expectancy in the attempt to explain behavior. In so doing, he founded a long-standing tradition of expectancy-value theories in behavioral science. These theories form the basis for most contemporary models of motivation (Feather, 1982). The basic idea is that behavior is explained by the linkage between expectancy and value (= individually weighted incentive), which is usually multiplicative in nature. We do not necessarily have to be consciously aware of the two components in order for them to influence our behavior. In fact, they need not even have a conscious representation. It follows that expectancy-value theories can, in principle, also be used to explain animal behavior.

5.4 Lewin’s Field Theory

Kurt Lewin’s “field theory” was designed to explain behavioral events in comprehensive and concrete terms by tracing them back to the specific conditions of the “field” that existed at the time a behavior occurred.

- According to this conception, which is borrowed from physics, a person is located within a force field and subject to its situational forces. These forces emanate from both the “external” situation (the environment) and the “internal” situation (the person). Thus, the field describes all behavior-relevant conditions residing in the existing situation and in the person’s internal states and establishes causal dynamic relationships between them.

Lewin's field theory differs from the explanatory approaches of learning and drive theory, as presented in Chap. 4, in three major respects:

1. It attempts to reconstruct the entire situation as it exists for the individual.
2. The explanatory approach must be psychological.

The internal and external determinants of behavior must be seen from a psychological rather than a quasi-physical perspective. Thus, stimuli – which behaviorists attempt to define in terms of “physical” events – are not among the fundamental units of causal analysis but rather perceived environmental events that offer the individual a number of behavioral choices. A psychological analysis, however, is not restricted to aspects that are phenomenologically given by internal states or external environmental conditions. It also includes aspects that are not consciously experienced but that nevertheless influence behavior. These may be affective reactions that are not consciously represented (cf. Kuhl, 2001), for example.

3. Simple connections in the sense of stimulus-response bonds are viewed as insufficient. All behavior is driven by underlying forces. This dynamic approach to understanding behavior goes beyond the assumption of a general, nonspecific drive.

For Lewin (1942), behavior is a function of the field existing at the time the behavior occurs. It is only the present that can determine behavior. Neither past nor future events can be remembered or anticipated in the present, thereby becoming effective determinants of behavior. Past events, such as learning, may have contributed structure to the present field, in terms of the peculiarities of both the person and the environment. But one cannot simply attribute present behavior to earlier events, as is often done in psychoanalysis. Lewin was skeptical of dispositional variables such as intelligence or “instinct,” because he saw them as inappropriate references to historical abstractions.

- Lewin's field theory is distinct from psychoanalysis to the extent that it sees behavior

as determined by the present field – by the subjective representations existing at the time it occurs. Childhood experiences can only have an impact on behavior in terms of their present representation.

Furthermore, Lewin (1942) believed that psychological situations should, wherever possible, be presented in terms of mathematical models, “to permit scientific derivations” and “to use a language which is logically strict and at the same time in line with constructive methods” (1942). Mathematical representations do not have to be exclusively quantitative; they can also be qualitative, as is the case in geometry. Lewin's field theory makes extensive use of topology, a form of geometry that refers to adjacent regions, but not to distances and directions. It also involves vectors with three determinants:

- Strength
- Direction
- Point of application

Lewin (1931a, 1931b, 1935) argued against psychological explanations of behavior in which classifications were based on external appearances, and in favor of analyzing the conditions that gave rise to those appearances, so that explanatory constructs with general validity could be identified. These explanatory constructs emerged to be the basic concepts of general dynamics, as developed in post-Galilean physics, e.g., potential, force, and field (analogous to electromagnetic or gravitational fields).

No less programmatic, but probably more important for the study of motivation, was Lewin's emphasis on an analysis of the total situation, which resulted in the well-known Lewinian equation (1946a).

- Behavior (B) is a function of person factors (P) and environmental factors (E): $B=f(P, E)$.

In principle, field theory thus recognizes the interactional relationships between person and situation factors, reflecting their mutual influences. In practice, however, field theory was unable to fulfill this programmatic pretension,

because it neglected the dispositional variables among the person factors in favor of the momentarily functional variables. This neglect of individual differences in motivation resulted from the skepticism toward “historical” explanations mentioned above, although field theory is not in principle at odds with this kind of approach. After all, the notion of previously acquired associations does not contradict the rule that behavior must be a function of the present field. They can provide a prestructuring of personal factors against which the present situation is perceived.

Lewin developed two different explanatory models that are, to a certain extent, complementary: the person model and the environment model. The environment model relates to motivational issues, the person model to volitional issues. This is despite the fact that Lewin tried to reduce volitional problems to motivational ones.

The two models differ in terms of their dynamic components. The person model involves energies and potentials, i.e., scalar magnitudes. The environment model employs forces and goal-oriented behavior (“locomotion” through behavioral regions), i.e., vectorial magnitudes. In the final analysis, however, both models are based on a homeostatic dynamic system. The states described tend toward the development of a homeostasis of tension or force. It is not the reduction of tension but its equalization that is the governing principle of the all-encompassing system or field (cf. Lewin, 1926a, p. 323ff.).

The Person Model

Lewin’s theory of motivation was prompted by his dispute with Ach. Lewin (1922) sought to demonstrate that Ach’s (1910) “determining tendency” not only explains a particular type of behavior but that it is the dynamic prerequisite for all behavior. Simply establishing a connection between stimulus and response is not sufficient. For learning to manifest itself in behavior, a force should always be present. Most important for Lewin was the question of energizing. This does not mean the use of energy to carry out ongoing cognitive or motor behaviors.

- Here, energizing refers to the central question of behavioral determinants. Which of the

behavioral tendencies available in a given situation will succeed and ultimately determine behavior?

Lewin attempted to answer this question by postulating changing tension states in various inner-personal regions (cf. 1936). Figure 5.1 presents the person as a system of separate regions. Each region represents a particular behavioral goal, either an enduring desire that might be labeled a need or a motive or a momentary intention. The individual regions differ in their proximity to one another, which represents their degree of similarity. It is greatest when two regions share a common boundary.

A further distinction relates to the position of the regions and whether they are more central or peripheral. Central regions share more boundaries with adjacent regions than do peripheral ones. This indicates “ego-proximity,” the personal importance of behavioral goals and activities, as well as their level of influence on other behavioral goals and activities, measured in terms of their number.

Tension Systems in the Person Model

Thus far, the person model represents a purely structural entity with regions, adjacencies, and mediating functions between inside and outside. One more structural characteristic should be mentioned, namely, the nature of the boundaries.

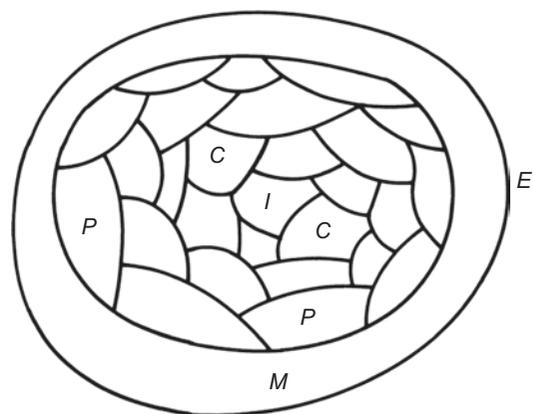


Fig. 5.1 Person model. The motor-perceptual region (*M*) mediates between the environment (*E*) and the inner-personal regions (*IP*), which may be either more central (*C*) or peripheral (*P*) (After Lewin, 1936, p. 177)

These can differ in their “permeability” and can allow “leakage” from one adjacent region to another. This structural characteristic of the boundaries is related to the dynamic component of the person model. It is here that Lewin introduces the concept of tension. Specifically, the tension states of the individual’s inner-personal regions can vary. The regions can be thought of as vessels filled with liquid under varying degrees of pressure. If one region is marked by an increased tension state relative to another, it represents, according to Lewin, a tension system. Tension systems strive for the equalization of tension with adjacent regions. This can be accomplished in two ways:

- The tension system representing an intended action may become discharged if it can access the border region of sensory-motor execution, i.e., if it gains control over behavior and guides it toward the goal.
- If, however, it does not find such an access, the force will push against the boundary walls of the tension system. How soon there will be an equilibration of tension as a function of its diffusion is now a question of the permeability of the boundaries and the temporal duration.

Both types of tension equalization are quasi-physical conceptualizations rather than genuine explanations. They have heuristic value for analyzing the variables relating to a number of behavioral phenomena addressed by Lewin’s students within the “psychology of action and affect.” These experiments have become classics in the field. The first type of tension equalization, producing activities that can serve the execution of a purpose, can help clarify the behavior that follows a completed or an interrupted action. Prototypical here is the Zeigarnik effect. Lewin’s student Bluma Zeigarnik (1927) found that interrupted tasks were more easily remembered than those that had been completed.

The second type of tension equalization, through diffusion to adjacent regions, can serve to explain phenomena such as need satisfaction through goal substitution (Henle, 1944; Lewin, 1932; Lissner, 1933; Mahler, 1933), the role of fatigue, emotionality, anger (Dembo, 1931),

and unreality (Brown, 1933) resulting from the discharge of a tension system. Fatigue, emotionality, and unreality are viewed as conditions that change the permeability of the regional barriers, but both types of tension equalization always relate to the implementation of firm intentions.

The structure of the inner-personal sphere is not permanently fixed. It becomes more differentiated as a function of the individual’s development and experience. It can be restructured, with each immediate goal forming a region of its own.

- As Lewin stated in his fundamental theoretical treatise on *intent, volition, and need* (1926b), action goals represent “quasi-needs,” i.e., derived needs. Quasi-needs are transitory in nature. They often arise from the intention to do something that is goal-related, e.g., to mail a letter to a friend. They form a tension system that will disappear only when the goal has been attained.

Quasi-needs

Quasi-needs may also arise without an act of intention, e.g., in connection with the intermediate activities leading to a goal associated with “genuine” – i.e., superordinate and enduring – needs. For instance, the instructions given by an experimenter are, as a rule, accepted by a study participant without an actual intentional act. This induces a quasi-need to carry out the imposed task, which is basically the same as a self-initiated intention. In both cases the activity is resumed spontaneously after interruption (cf. Ovsiankina, 1928). According to Lewin, the strength of a quasi-need (or, more specifically, of the corresponding tension system) is not dependent on the presence or intensity of the intention but on the extent to which the quasi-need is related to or is fueled by real needs (which, for us, represent motives):

The intention to mail a letter, to visit a friend, even the intention of a subject in an experiment to learn a series of nonsense-syllables, does not represent an isolated entity, even in the case where the action sequence represents a relatively well-defined whole. Instead, it arises from more far-reaching goals, such as the intent to take care of one’s business, to make progress in one’s studies, or to do a favor for a friend. It is not the strength of an intention, but

(apart from other factors) the strength and the vital importance, or more correctly, the degree to which the genuine need – in which the quasi-need is embedded – has become firmly established (“Tiefe der Verankerung”), which determines the effectiveness of an intention. (Lewin, 1926b, pp. 369–370)

We will see shortly, when we examine the environment model, that a tension system, whether it represents a need or a quasi-need, is related to specific changes in the perceived environment. Objects that can facilitate a discharge, i.e., serve to satisfy a need, acquire “incentive character,” a valence that sets them off from their environment and induces goal-oriented approach behavior. If, for example, you want to mail a letter in an unfamiliar part of town, you are much more likely than usual to notice a mailbox, even if you are not intentionally looking for one. The strength of the valence is dependent on the strength of the tension system. This postulated relationship is the only connection between the two models, which, as we will see later, are totally different.

Summary

Although field theory pays very little attention to individual differences, the person model does incorporate some attempts to describe individual differences in terms of enduring differences in the structural characteristics of the inner-personal space. For one, this applies to different stages of personality development, represented by both the degrees of differentiation (i.e., the number) of inner-personal regions and the permeability of the boundaries of individual regions. For another, Lewin (1935, Chap. 7) used the model to reconstruct and “explain” differences between “normal” and “feeble-minded” individuals, concluding that “feeble-minded” individuals have stronger (less permeable) boundaries between the inner-personal regions and fewer regions than “normal” individuals.

Lewin’s concept of tension systems differs from Hull’s drive theory in two main respects. First, the tension systems are always goal-specific and do not serve a general incentive function for every conceivable response; second, the tension systems do not simply activate previously established response habits (stimulus-response bonds)

that have, in the past, led to the accomplishment of the particular goal. They are focused on achieving goal states by means of flexible actions that are adapted to the situational conditions.

The person model, however, does not specify how this objective is accomplished. In fact, it is not clear how particular tension systems gain access to sensorimotor border regions and how, within these regions, executive processes evolve and are carried out.

The model cannot describe transactions with the environment; they must simply be assumed. The person is totally encapsulated. In other words, the person model does not meet Lewin’s requirement of an analysis of the total situation. Neither does it allow for motivating expectancies and incentives (demand characteristics, valences) within the particular person-environment relationship. For this, Lewin developed the environment model.

Despite these limitations, the person model has stimulated a series of important experiments. Because they relate to issues in volition rather than motivation, we will examine them below (aftereffects of incomplete tasks).

The Environment Model

From an early stage in his research, Lewin observed the psychological structure of the environment as an action sphere. He found remarkable differences between the psychological and the geographical structure of the environment.

Lewin frequently filmed the behavior of children in free play situations, typically on a playground, and analyzed their locomotion within the playground’s structures as a psychological sphere of action. (One example of this is the conflict-dominated locomotion of the child in Fig. 4.10 in Chap. 4, who wants to retrieve a toy swan from the water but, at the same time, is afraid of the waves.)

To account for such phenomena, the environment model must be able to describe the directions of all possible goal behaviors within a psychological, rather than a geographical space.

The psychological space, the psychological field, consists of a variety of regions. The regions are not literally physical spaces but psychological potentialities for actions and events. Individual regions represent potentially positive

or negative events. They are goal regions with positive valences or repelling regions with negative valences. The remaining regions represent potential instrumental responses, leading toward a goal region or away from a repelling region. In other words, they represent means to an end. One of the regions within the environment model represents the person, usually indicated as a dot or an empty circle. To reach a goal region with a positive valence, the person must traverse, i.e., behaviorally attend to, all of the regions between it and the goal region. If, for example, you want to own and drive a car, you must first acquire a driver’s license, save money, decide on a make of car, find a dealer, etc.

The environment model represents an attempt to map out the potential actions available in a given life situation that will lead to a desired goal or avert a negative event, rather than an explanation of these actions. It is a cognitive representation of the means-ends relationships that a person perceives with regard to potential behaviors and their outcomes, in other words, the expectations motivating behavior. This is the structural component of the environment model.

The dynamic component is expressed in terms of force fields that have their centers in regions with a positive or negative valence, as shown in Fig. 5.2. Forces with specific intensity act upon the person, and the resultant summation of vectors gives direction and strength to his or her psychological locomotion. Conflict results when opposing forces of approximately equal strength act upon the person.

Direction, in this context, means the sequence of individual, purposeful actions. Frequently, different action paths lead to the same goal. In this case, the psychological direction remains unchanged; there is an equifinality of goal-oriented behavior. Thus, the environment model is essentially designed to clarify motivational issues, i.e., the “what” and “how” of approach and avoidance.

Because topological representations consist only of neighboring regions and lack direction, Lewin (1934) sought to expand this approach to a “hodological” conception (from the Greek “hodos” meaning path). Action paths represent connections between the region in which the person is presently located and the goal region. Figure 5.2a shows three different action paths leading to the same goal. Lewin assumes that there is a “superior” path that is preferred because it traverses the smallest number of regions and is therefore “shortest.” Shortness or minimal psychological distance, however, is dependent not only on the number of intermediate regions. It can also be a function of the degree of difficulty, the amount of effort required, and the possible dangers inherent in traversing the various regions, quite independent of their number, e.g., on a battlefield. Topology disregards both directions and distances.

- Despite Lewin’s efforts (1936, 1938, 1946a), the question of how psychological distance is to be measured and represented remains unanswered to this day. As we will see, however, an answer to this question must be found if we

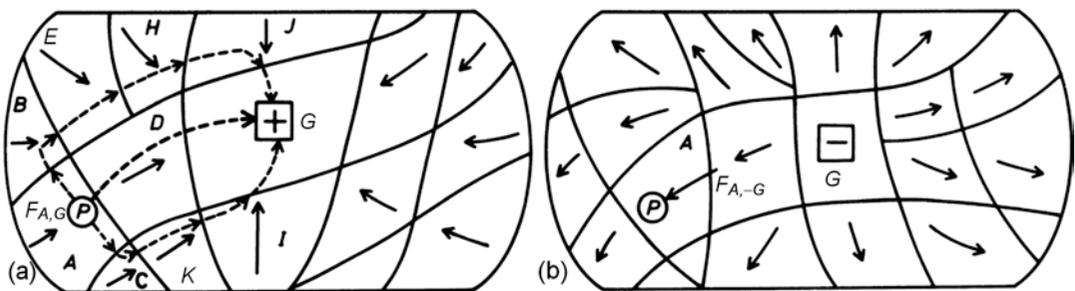


Fig. 5.2 The environment model illustrated by a positive and a negative force field. All forces within the positive field (a) are focused on the goal region G . $F_{A,G}$ is the force acting upon the person and corresponds with the positive demand characteristics (valences) of an individual located in region A and a goal located in region G . There are three

possible action paths leading to the goal. They require the individual to pass through different numbers of adjacent regions (actions): $A-D-G$; $A-C-K-I-G$; and $A-B-E-H-J-G$. All forces in the negative force field (b) gravitate away from region G . The force $K_{A,-G}$ represents the negative demand characteristics of Z

are to determine the strength of forces arising from positive or negative valences and taking effect in various regions of the field.

The Postdictive Environment Model

The environment model cannot explain behavior but can only reconstruct it. It is postdictive not predictive, assuming the conditions that motivate behavior to be given and known. Specifically, these are:

- Motivating incentives, i.e., regions of the psychological field that are endowed with valences
- The cognitive structuring of expectations, i.e., the means-ends relationships of action sequences along the path to the goal

The latter are depicted as neighboring regions with traversing paths. The heuristic value of this model lies in its analysis of the conditions leading to behavior in a relatively free situation, rather than in an ability to explain it. The model can facilitate the detection and identification of determining factors within the complexity of the psychological total field, e.g., forces, barriers, action paths, and proximity to the goal. Examples of its application are the analysis of reward and punishment (1931a), the typology of conflict (1938; see also Chap. 4), and the simple taxonomy of the direction of behavior presented in Table 5.1. The direction of behavior is determined by whether the valence of the region results in approach or avoidance behavior and whether the person is already in that region or still in another one. The combination of these determinants yields four basic classes of directed behavior, as specified in Table 5.1.

Table 5.1 Taxonomy of the direction of behavior

Position of the person	Direction of behavior	
	Approach	Avoidance
Valence region (A)	(A, A) Consummatory behavior	(A, -A) Escape behavior
Outside the valence region (B) (or C, D, ...)	(B, A) Instrumental behavior	(B, -A) Avoidance behavior

Further variations of the environment model can be found in its application to problems such as:

- Decision-promoting processes of motivation (cf. Cartwright & Festinger, 1943; Lewin, 1943, on food purchases)
- The social-psychological situation of adolescents (Lewin, 1939)
- Group formation under different leadership styles (Lippitt, 1940)
- Group dynamics (Lewin, 1946b)
- Group decisions (Lewin, 1947)
- Ecological aspects of large and small school settings and their influence on student activity (Barker & Gump, 1964)

Relative to the person model, however, the environment model generated barely any true experimentation, probably because it assumes relatively free situations rather than the highly controlled ones demanded for experimental design.

Relations Between the Two Models

It is very difficult to reconcile the person model and the environment model, for the simple reason that their dynamic components do not correspond. The person model is based on tension, the environment model on forces. Technically speaking, it is a question of pressure states within vessels as opposed to an all-encompassing force field. This also means that the apparent similarity in the structure of the regions in the two models is only superficial. Furthermore, the adjacency of regions does not have the same meaning in the two models. In the person model, it denotes similarity; in the environment model, means-ends relationships (see also Heider, 1960).

There is, however, one major point of correspondence between the two models – the covarying relationship between the need state of the person (tension system) and the valence of an object or action sphere in the environment. In Lewin’s words:

To a certain extent there is an equivalency between the statements “this or that need exists” and “this or that structural region possesses incentive characteristics for these or those actions”. After all, a change in the need produces a corresponding change in the incentive characteristics. (Lewin, 1951, p. 353)

This statement raises the question of whether the need of the person and the valence in the environment are, in fact, two perspectives on the same thing. Does it mean that whenever there is a need, there is also a valence and, conversely, that a corresponding need can be inferred whenever there is a valence? Or would it not be more appropriate to assume a mutual interaction between cause and effect?

The Meaning of Valence

Lewin holds that whenever there is a valence, there must also be a need. What is questionable is whether the reverse is true. A need can emerge in the absence of opportunities within the environment to satisfy it (i.e., in the absence of objects that can take on valence characteristics). In this case, the environment would include wishful thinking at the level of unreality within the life space. One could then say that every need creates a corresponding valence. But Lewin does not accept the reverse, that a valence creates a need. What he does accept is that a portion of the valence is not dependent on the existing need state but inherent in the valence object itself. For example, we find some types of food more attractive than others, independent of our hunger state. Therefore, valence (Va) has two determinants:

- It is a function of the need tensions of the person (t).
- The perceived “nature” of the goal object (G): $Va(G) = F(t, G)$; (cf. Lewin, 1938, pp. 106–107).
- Lewin’s models do not deal with questions of incentive motivation. Rather, his theory of motivation is restricted to the following processes: A tension system (a need or quasi-need) is somehow created within the person. The tension results (under appropriate circumstances) in a corresponding environmental valence. The valence produces a force field in the environment that initiates and gives direction to the organism’s behavior. The behavioral sequence is guided by a means-end structuring of the action paths leading to the

goal region. Should the goal be attained, the need is satisfied, the tension system dissipates, the valence disappears along with the force field, and the behavior is terminated.

So what, precisely, is valence? According to Lewin, it is the determinant of the psychological force (f , “force”) that pushes or pulls the person (P) toward the goal region (G). Lewin further assumes that this psychological force ($f_{P,G}$) is dependent on the relative positions of the person and the goal region, i.e., the psychological distance. For Lewin this dependence is not invariant. In many cases it would appear that the psychological force decreases with increased psychological distance from the goal region (d , distance; $d_{P,G}$). At least that is what Fajans (1933) observed in infants and toddlers. Lewin’s (1938) formulation reads as follows:

$$f_{P,G} = \frac{Va(G)}{d_{P,G}} = \frac{(t,G)}{d_{P,G}}$$

Psychological force according to this definition would today be labeled motivational strength or its resulting motivational tendency. It is essentially a function of Lewin’s hypothetical construction of valence. Lewin went one step further, combining valence multiplicatively with an expectancy construct, labeled potency (P_o).

Potency is a conceptually somewhat ambiguous construct that plays a role in choice situations. It reflects the extent to which a positive or negative outcome of a choice is salient, which in turn is a function of the perceived likelihood of a positive or negative outcome. In this case, the “effective force” is defined as:

$$\text{effective force} = \frac{Va(G) \times Po(G)}{d_{P,G}}$$

This concept, which was developed in the context of setting levels of aspiration (Hoppe, 1930), was the direct predecessor of the theories of motivation that remain dominant to this day, namely, expectancy-value theories.

Summary

Lewin's major achievement was a penetrating conceptual analysis, leading to the identification of the constituent elements of a theory of motivation. To this day, the main weakness of field theory is that both the person and the environment model can generate only postdictive "explanations." There is little in the theory that would allow specific, cogent conditions to be identified in advance and thus permit reliable predictions of behavior. This weakness arises from the field theorists' neglect to tie their theoretical constructs to observable antecedents and outcomes. How can one specify in each individual case the magnitudes of t or G , valence, psychological distance, and force? What determines the means-ends structure of the action path leading to the goal region? Although the relationships among the hypothetical constructs have been carefully defined, their relationships to observable phenomena have been neglected. This deficiency is particularly apparent when this model is contrasted with those of learning and drive theories.

Another deficiency arises from the neglect of individual differences in dispositional variables. This particularly applies to the constructs t and G . The situational factors (G) capable of eliciting specific motives (t) remain largely unspecified, as does the need to at least delineate the essence of individual motives, if not to classify them. All questions relating to motive dispositions are essentially ignored, not only their classification but also their activation, measurement, and genesis. The main focus is on matters of motivation – goal orientation, choice, and conflict – as well as on their impact on behavior. Matters of volition, such as the aftereffects of interrupted tasks, in the form of resumption and substitute tasks, are also considered. Self-regulatory processes of intention forming or action control are not postulated, however, probably because the environment model simply assumes the existence of a cognitive representation of a particular situation, without explaining how it arises, e.g., in terms of the adjacent segments of the action path.

Despite its shortcomings, field theory has contributed significantly to the clarification of motivational issues. Unlike laboratory research,

which necessarily tends to take a rather one-sided approach, it uncovered a variety of psychological phenomena in human motivation. Furthermore, it generated a series of experimental paradigms that continue to stimulate and enrich motivational research beyond field theory to this day.

Aftereffects of Incomplete Tasks

In the *Psychopathology of Everyday Life*, Freud (1901) collected many examples of the aftereffects of unfulfilled desires, i.e., unrealized actions. Even if these are actively suppressed because of their inappropriate or unacceptable nature, they do not just disappear but become manifest in a variety of covert forms, in free associations, in dreams, or in slips of the tongue, all of which result in an inadvertent interference with an action sequence. These phenomena are commonly known as Freudian slips.

Lewin based his model on similar observations, namely, the aftereffects of unfinished tasks. His student Bluma Zeigarnik (1927) provided experimental confirmation of his assumptions (see the following excursus). More recent research on rumination has returned to this topic area (see Martin & Tesser, 1989).

Aside from these two classical procedures, task retention and resumption, four further behavioral indicators have since been linked to the aftereffects of unfinished tasks:

1. Choice of tasks to be resumed, i.e., the choice between two tasks presented for a second time, one of which was solved at first presentation, while the other was not (Rosenzweig, 1933, 1945; Coopersmith, 1960).
2. Changes in autonomic responses resulting from a casual reference to unfinished materials, while the respondent is working on another task (Fuchs, 1954). It has been observed that task interruption is accompanied by increased muscle tonus (Forrest, 1959; Freeman, 1930; Smith, 1953).
3. Differences in the recognition threshold for words referring to completed or to interrupted tasks (Caron & Wallach, 1957; Postman & Solomon, 1949).
4. Increased attractiveness of a task following its interruption (Cartwright, 1942; Gebhard, 1948).

Lewin said that the idea of investigating unfinished tasks came to him when he realized that he needed to define the concept of tension in the person model in terms of concrete, experimental operations (cf. Heider, 1960, p. 154). There are a number of hypotheses that can be derived from the person model, each relating to one of the three defining characteristics of that model, namely:

Excursus

The Zeigarnik Effect

Participants were presented with 16–20 different tasks, half of which were interrupted before completion by the introduction of the next task. After the experiment, participants were casually asked which tasks they could remember. The aftereffects of the incomplete tasks were manifested as a better retention of these tasks. This finding became known as the “Zeigarnik effect.”

A variation of this experiment was carried out by another of Lewin’s students, Maria Ovsiankina (1928). Instead of testing task retention, Ovsiankina observed the spontaneous resumption of interrupted tasks. To this end, participants were left with the task material, while the experimenter left the room under a pretext and covertly observed whether or not the participant resumed the tasks. This approach has the advantage of showing more direct effects of unfinished quasi-needs. It avoids the confounding of the demand to recall, which applies equally to finished and unfinished tasks, with the effects arising from unfinished quasi-needs.

- The tension state of a region (tension system).
- The regional structuring (e.g., central vs. peripheral; degree of differentiation).
- The nature of the material (i.e., the permeability of the regional boundaries).

An account of the respective hypotheses and results can be found in Heckhausen (1980, p. 189).

Some findings do not relate to the person model but can be interpreted within the environment model. Instead of positing an inner-personal tension state, this model assumes a psychological force to pull the person in the direction of a particular action. As we have seen, this force depends on the valence of the action goal (G) and the psychological distance (d), while the valence depends on the need strength (t) and on characteristics of the goal (G) that are unrelated to the person:

$$F = \frac{\text{Va}(G)}{d_{p,G}} = \frac{t, G}{d_{p,G}}$$

Zeigarnik found that incomplete tasks that have a definite ending are retained better than indefinite serial tasks (like crossing out particular letters in a text) that are highly repetitive. This could be from a factor G , a characteristic of the goal that is independent of the person and that codetermines the strength of the valence. Another finding can only be explained in terms of the other determinant of psychological force, namely, psychological distance, $d_{p,G}$.

- The closer someone is to their goal when the interruption occurs, the greater the Zeigarnik effect (Ovsiankina, 1928).

It was also shown that it is not the interruption of the action per se that is responsible for the Zeigarnik effect. The determining factor is the psychological situation as it is perceived by the individual; i.e., whether the goal (e.g., solving a task correctly) is perceived as having been accomplished or not. Marrow (1938) demonstrated this effect through a reversal of the experimental design. He informed his participants that he would interrupt them each time they were on the right path to a solution but that he would let them continue if they were not. Under these conditions, participants retained the “finished” failed tasks better than the interrupted (successful) ones (cf. also Junker, 1960).

These are the results that support the theory. There are, however, a large number of studies that did replicate Zeigarnik effects where they would have been predicted. These findings did not cast serious doubt on the validity of the postulated after-effects, however, or lead to the Zeigarnik effect being viewed as a “now you see it, now you don’t” phenomenon. Rather, critical analyses of the experimental conditions in question generally raised and/or confirmed suspicions that the necessary psychological conditions had not been established or that the experimental design was flawed (cf. the analyses by Junker, 1960, and Butterfield, 1964). If, for example, the interrupted tasks are much more difficult than the completed ones, participants can easily gain the impression that they are too difficult or even impossible to solve. Because they do not expect to reach the goal, they reject the interrupted tasks and do not develop a quasi-need to solve them.

Most experimental flaws in this context relate to memory factors. Some settings permit over-learning; in others, participants approach the experiment with the intention to learn, as was observed for some of Zeigarnik’s participants. Finished tasks frequently provide more opportunity for rehearsal, because the experimenter allows more time for these tasks (in Abel, 1938, it was six times as long as for the interrupted tasks). Alternatively, the order of presentation may facilitate the retention of finished tasks, e.g., if they occur at the beginning or end of a sequence (e.g., in Alper, 1946, or Sanford & Risser, 1948). Finally, the tasks may be overly homogeneous, resulting in the formation of a region that inhibits reproduction.

Complications of the Zeigarnik Effect

Zeigarnik’s method entails serious complications for a psychology of memory. Any memory task involves, in three sequential processes:

1. Information uptake (learning)
2. Storage
3. Retrieval of stored information (reproduction)

The last two phases of storage and retrieval involve memory. The Zeigarnik effect is assumed to be a phenomenon of memory, rather than of learning. To demonstrate the effect, one would, strictly

speaking, first have to show that the finished and unfinished tasks are learned equally well in the acquisition phase, before showing that interruption during the storage process results in differential “fates” for the respective memory traces, which, when recalled, produce the Zeigarnik effect. It is difficult to exclude the possibility that the interrupted tasks are simply learned better in the first place. This would require a test of memory to be implemented before the participant gains the impression of having finished the task (or not). It would, however, be possible to redefine the Zeigarnik effect as a phenomenon of learning, rather than of memory (storage and retrieval). Results indicating that completion of an interrupted task prior to the reproduction phase (retrieval) has no effect on the superior retention of the task but would then represent a serious challenge to the theory of tension systems.

Caron and Wallach (1959) tried to do just that (see the example).

Example

Caron and Wallach (1959) informed a group of study participants that they had been misled and that the unfinished tasks were in fact impossible to solve. According to Lewin’s reasoning, these tasks would then be seen as completed, and the experimental group should no longer be able to reproduce them any better than the uninterrupted tasks – in contrast to a control group that was not offered this quasi-therapeutic explanation. However, the data showed that both groups retained approximately the same amount of interrupted material, indicating that there was selective learning during the acquisition phase.

It would appear that the determining factor for the memory trace is not the tension system and its subsequent release but selective learning during the acquisition phase. But can these results really be said to disprove Lewin’s theory of the tension system? Were the interrupted tasks and their associated quasi-needs really as “finished” or discharged

as their completed counterparts? Might it not be the case that the explanation given by the experimenter prior to reproduction refreshed the unfinished material or that the effect of the tension release was offset by an additional learning effect? Because Caron and Wallach found no Zeigarnik effect for the control group, it seems likely that the explanation given to the experimental group provided an additional aid to retention.

Findings that appeared to contradict the hypothesis that the Zeigarnik effect increases in strength as a function of stronger quasi-needs soon began to accumulate as well. A number of studies showed that the more the tasks took on the significance of a test, the more likely the effect was to disappear or become reversed (e.g., Alper, 1946, 1957; Green, 1963; Rosenzweig, 1941, 1943; Smock, 1957). From the perspective of psychoanalytic repression theory, Rosenzweig explained this effect as being a self-defense tendency – despite his observation that increased pressure to perform results in an increased retention of finished tasks, rather than in a decreased retention of unfinished ones (cf. Glixman, 1948; Sears, 1950). All in all, findings are inconsistent and remain confusing. There are also a number of studies showing that test conditions increase the Zeigarnik effect (e.g., Junker, 1960; Marrow, 1938; Roßler, 1955; Sanford & Risser, 1948). Within field theory, it would be quite possible to explain self-defense tendencies as being intervening effects of a central need that cause the Zeigarnik effect to disappear.

Study

Zeigarnik Effect or Shielding Self-Esteem? A Decision Experiment

Participants in studies by Beckmann and colleagues (Beckmann, 1996; Beckmann, Bobka, Fehrenbach, Hellebrandt, & Rost, 2004) were administered an ego-involving intelligence test. For one half of the tasks, they received the feedback “completed successfully” after each task; for the other half, the feedback was “not completed successfully.” In one

condition, the experimenter induced the motivation for positive self-presentation by explaining that participants were being asked to write down the tasks they had worked on as a basis for the subsequent discussion of their intelligence scores. Participants in the second condition were simply asked to recall the tasks they had worked on. The classic Zeigarnik effect was observed in the latter condition, with participants recalling more unsolved than solved tasks. In the self-presentation condition, the effect was reversed. As a second experiment showed, however, this self-presentation effect only seems to be observed when recall is measured in terms of criteria that can be consciously influenced, such as listing tasks in a test of recall. In other experiments, activation of the tasks was measured in terms of responses that were not subject to conscious control. After completing the test, participants in these experiments were shown tasks they had attempted as well as tasks that had not been administered. They were asked to specify which tasks had been featured in the test and which had not. The dependent variable was the time taken to make the correct choice. Participants in the non-self-presentation condition recognized unsolved tasks quicker than the tasks they had solved. The unsolved tasks were evidently still more strongly activated than the unsolved tasks. With decision latency as the dependent variable, however, the effect was not reversed in the self-presentation condition. Here, too, participants recognized unsolved tasks more quickly than solved tasks. These findings indicate, in fact, that the self-presentation effect is derived from conscious processes of evaluation and that – independent of this effect – incomplete tasks always remain more strongly activated than completed tasks, as indeed predicted by Lewin’s assumption of tension systems.

Greenwald's (1982) work on the Zeigarnik effect is based on the same logic. He assumes, under ego-involving conditions, that a noncompletion of tasks is seen as failure, meaning that the memory of unfinished tasks threatens the maintenance of a positive self-concept. Accordingly, people are more likely to remember completed tasks (successes) than incomplete ones (failures). Beckmann et al. (2004; Beckmann, 1996) tested these assumptions experimentally (see the decision experiment in the study box on previous page).

Individual differences also have a role to play in the Zeigarnik effect. Zeigarnik had already observed stronger effects for "ambitious" than for "nonambitious" participants.

At first, individual differences were used merely as post hoc explanations based on behavioral differences observed during the experiments. Soon, however, researchers began to select groups of participants on the basis of characteristics such as "ego strength" (Alper, 1946, 1957), "need for recognition" (Mittag, 1955), "self-esteem" (Coopersmith, 1960; Freud; Worchel, 1957), and, above all, "achievement motive" (Atkinson, 1953; Heckhausen, 1963b; Moulton, 1958; Weiner, 1965).

- Individuals with a strong, success-oriented achievement motive generally show a stronger Zeigarnik effect than those with a weak, failure-oriented motive.

Substitute Actions

The aftereffects of unfinished tasks also include the possibility of satisfying unsatisfied needs through substitute actions that are similar to, or derived from, the unfinished task. Here again, Freud was the first who called attention to this form of aftereffect in 1915 (see Freud, 1952). And again it was Lewin (1932) who initiated its experimental analysis. Although inspired by Freud, he was dissatisfied with Freud's speculative inferences based on individual clinical observations.

Lewin analyzed the conditions under which unfinished tasks lose their aftereffects through

completion of another task. The intervening activity can be said to have "substitute value" for the original task. Ovsiankina's experimental paradigm of spontaneous resumption was ideal for this investigation. The experimenter simply inserts a task that can be completed between the interruption and the resumption of the original task. If the original, interrupted task was resumed, the intervening activity did not have substitute value; if it was not resumed, substitute value can then be inferred.

Again, it was the person model from which the hypotheses were derived, specifically, from its two postulates. First, the relative permeability of the regional boundaries permits an equalization of tension between neighboring regions. Second, the adjacency of regions defines the level of similarity of the respective goals and activities. This would suggest that a release of a tension system is most likely to occur through completion of a similar activity. If region A is a tension system, some of the tension will then flow into neighboring region B. The differential tension is thus equalized.

Excursus

Substitute Actions: Substitute Value of Actions

Lissner interrupted children who were kneading clay figures and asked them to make another figure. The substitute value of the intervening task generally increased as a function of the similarity of the two tasks. One important dimension of similarity proved to be task difficulty level. If the substitute activity was easier than the interrupted task, it had little substitute value, but if it was more difficult, its substitute value was very high, i.e., there was little interest in resuming the original task. Situational factors relating to the individual's action goals also proved to have a strong influence on the substitute value of a task. If, for example, someone wants to construct something for a particular person but, before its completion, is told to construct

the same thing for another person, the second task has little substitute value (Adler & Kounin, 1939). The same applies when the experimenter introduces a similar activity but gives it a completely different label (Lissner, 1933).

Mahler varied substitute activities in terms of their level of reality, i.e., thinking about finishing the task, talking about how to finish it, and actually finishing it. She found that substitute value increased with the degree of reality of the intervening activity or, more specifically, with its level of appropriateness to the interrupted task. (For example, thinking has a higher reality level for problem solving than for motor action.)

Mahler's studies inspired a strand of research focused on the concept of symbolic self-completion (Wicklund & Gollwitzer, 1982). Instead of interrupting tasks and leaving them incomplete, the goals, attributes, and competencies inherent in the participant's self-definition were challenged. Individuals who had thus been "made incomplete" now grasped at every opportunity, even if it were only symbolic, to present themselves as "self-completed."

Henle carried out extensive studies attempting to explain substitute value in terms of the environment model rather than the person model, particularly in regard to the relative valences of the interrupted and the substitute activities. In her studies, participants first rated the attractiveness of various activities. Based on these data, Henle generated various combinations of attractive and nonattractive, interrupted, and substitute tasks. She found that if the valence of the substitute activity is lower than that of the interrupted activity, the substitute value is low, approaching zero. Conversely, the greater the valence of the intervening activity, the greater its substitute value.

The conditions under which another activity takes on substitute value were investigated primarily by three of Lewin's students (see the excursus below): Lissner (1933), Mahler (1933), and Henle (1944).

5.4.1 Tolman's Analysis of Goal-Directed Behavior

Lewin's explanatory model proceeds from the present conditions in the total situation: the valences within the environment and the structuring of the life space in terms of potential actions leading to the goal. He supposes the prior existence of valences and expectations (response-consequence contingencies) but pays little attention to the questions of how these might be objectified or how they are generated. The restructuring of an individual's life space at any moment in time may have some validity in the case of an empathic relationship between the experimenter and that individual, although even this would not be acceptable to the behaviorists because of its mentalistic nature. When dealing with children or animals, however, the lack of a firm foundation for explanatory concepts, such as valences, incentives, and expectations, is immediately apparent. Doubts may arise about the presence of a particular explanatory factor and its actual effect.

Expectancy and Goal Orientation

Tolman (1932), independent of Lewin, arrived at a rather similar explanatory model in the late 1920s, based on behavior observed in rats. Although Tolman was committed to behaviorism, he believed that nonobservable cognitive processes played an important role in directing an organism's behavior. Instead of simply presupposing such cognitive processes mentalistically, however, he attempted to translate them into observable events, i.e., to expose these internal, nonobservable events by tying them to the antecedent conditions and subsequent outcomes, both of which are observable. Thus, Tolman became the first theorist to define intervening variables in

terms of hypothetical constructs and to recognize the need to anchor them to operations and observations (Chap. 2). Does a rat in a maze know the shortest route to the food box, i.e., have expectations about response-consequence contingencies ($R-S^*$)? If one follows Tolman in drawing connections between the following observations and operations, the answer is yes:

Consider a rat, which has completely learned a maze, so that when put in at the entrance, he dashes through like a shot, turning here, there, and yonder, entering no blind alleys and arriving at the food box in only some 4 or 5 seconds from the start. Suppose, now, one of the alleys be considerably shortened between trials. What happens? On the trial after, the animal runs kerplunk into the new end of the alley. In short, he acts as if the old length of the alley were still going to be present. His behavior postulates, expects, makes a claim for that old length. (Tolman, 1926, p. 356)

Tolman pursued a “psychological behaviorism.” What distinguished him from other contemporary learning theorists, and brought him closer to Lewin’s formulations, were three related approaches to the explanation of behavior.

Tolman’s Psychological Behaviorist Perspective on Behavior

1. Molar behavioral units should be observed in preference to molecular ones. It is not single muscle twitches or glandular secretions that signal goal orientation and purpose but global sequences of behavior.
2. The premature reduction of behavior to physiological and neurological bases contributes little to behavioral explanations if psychological aspects remain unexamined and unspecified.
3. Because behavior is always oriented toward a goal object or goal state, it must be viewed and analyzed in terms of goal orientation.

Tolman insisted that the postulate of goal orientation does not have to remain a mentalistic and highly abstract concept but that it can be objectified

in terms of various aspects of behavior. Indeed, he studied three aspects of goal orientation extensively: persistence, docility, and selectivity. Persistence implies “persistence until,” i.e., perseverating until a particular object or state has been reached. Docility means increased learning over time in identical or similar situations. Selectivity implies spontaneous behavior that is not influenced by external pressures, the preference for a particular behavioral option in the face of several choices.

Tolman’s approach provided new insights on Thorndike’s “law of effect” (Chap. 2), which had, until then, been seen purely as a learning principle.

Because operant learning was viewed as dependent on the outcome, the success, and the satisfaction of a need, and because the learning process itself was seen as nothing more than an association between stimuli and responses (although this represents a purely hypothetical conceptualization or a quasi-neurological speculation), the motivational conditions of the observed changes in behavior (learning) continued to be ignored. Classical learning experiments were designed to demonstrate the learning process in terms of objectively observable behavior, as measurable performance. There seemed to be no need to distinguish between learning and behavior. Indeed, no clear distinction was made between motivation and learning until Tolman presented the findings of his research.

Incentive Effects

The narrowly conceived stimulus-response approach was incompatible with Tolman’s program of behaviorism, which emphasized the molar and goal-oriented aspects of behavior. Is learning really nothing more than the “stamping in” of static stimulus-response bonds? Could it not also involve the formation of internally represented cognitive maps that mediate expectations about what leads to what? Must behavior necessarily be viewed as the final step in a learning program in which the organism is, so to speak, pushed from behind? Could it not be that the organism is more freely pulled toward the goal, guided more flexibly along the way by means-ends expectations, without diversions (i.e., trial and error)?

In the 1920s, some researchers – primarily from Tolman’s group – began to vary the incentive characteristics of a goal. These variations

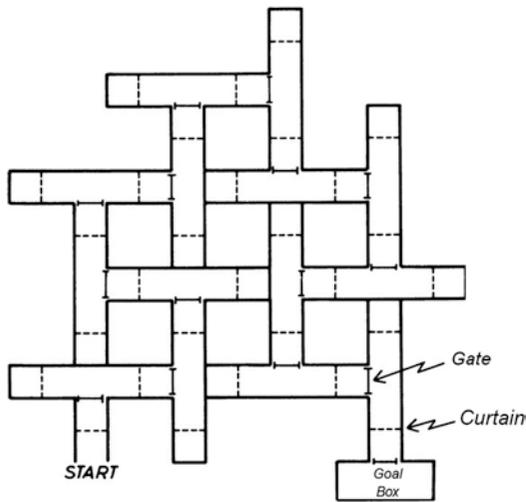


Fig. 5.3 Layout of a 14-part T-maze

resulted in abrupt changes in behavior, totally inconsistent with the notion of a gradual learning process. Behavior and learning now became separate entities, and it was possible to separate the experimental analysis of behavior from learning. In his book *Purposive Behavior in Animals and Men* (1932), Tolman integrated these results into a theory of incentives and expectations. Before considering the individual studies, let us look at the experimental apparatus used in these learning experiments, namely, the T-maze. As shown in Fig. 5.3, this maze consists of a number of interconnected T-shaped pathways, one branch leading to a new T-shaped section, the other forming a blind alley.

Experimental Evidence for Incentive Effects

An early series of investigations looked at the behavioral effects of different incentive strengths. The first of these investigations dates back to 1924. At that time there was great interest in determining the effect of need strength on activity using the Columbia Obstruction Box (Chap. 4, Fig. 4.2). One shortcoming of these studies was that the incentive value of the goal object was inadequately controlled. Simmons (1924) was the first to focus on incentive factors. She found that the speed of maze learning varies with the incentive value of the food in the goal box. The animals were all equally hungry at the time

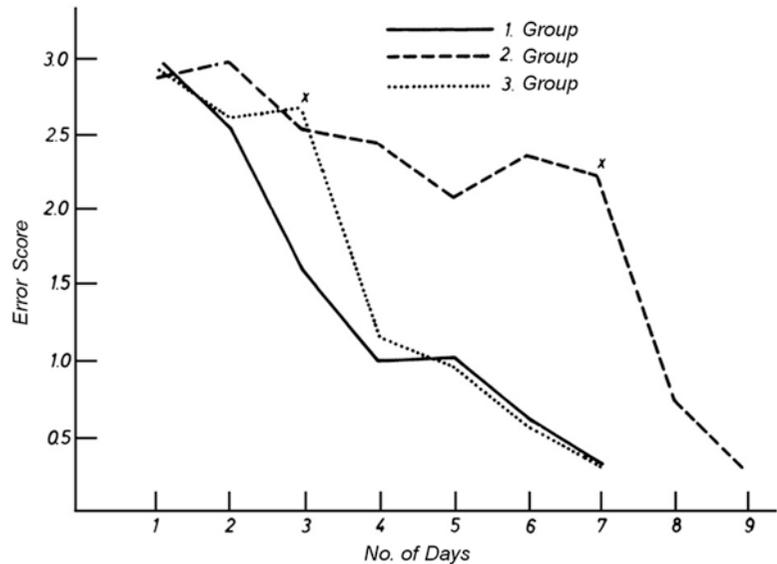
of the experiment, and did not receive their daily food ration until a few hours after the experiment, when returned to their cages. Before each trial, the rats were permitted a quick nibble on the food in the goal box. They were then placed in the start box. It emerged that the rats' running speed increased and error rate decreased more rapidly in trials with bread soaked in milk than in trials with sunflower seeds. This difference in incentive effect permits two interpretations: either stronger incentives facilitate more rapid learning or learning is identical under both incentive conditions, but a lower incentive value of the goal results in a reduced motivation to reach it. The first explanation would be consistent with Hull's (later) reinforcement theory; the second, with Tolman's postulate that – along with the present level of learning – the strength of the demand for the goal object, which derives from incentive strength, directly determines behavior.

The experimental findings of Elliott (1928) provided support for the latter interpretation. Elliot varied the incentive value in learning experiments with rats and found an increase in the error rate following the switchover to a lesser food incentive. This effect was not attributable to unlearning but could only be the result of a motivational effect that was unrelated to learning. This implies that learning is not synonymous with behavior and that a distinction must be made between learning and performance. It is clear that the incentive value of the goal object can have an independent effect on behavior.

Latent Learning: The Distinction Between Learning and Motivation

The extreme case of incentive variation is its total absence. In this case, there is no reinforcement, and goal-oriented behavior cannot be expected. Can learning still take place under these conditions? Blodgett (1929) was the first to show that it can. In his so-called latent learning experiment, three groups of hungry rats were placed in a maze once a day for nine consecutive days. The first group found food in the goal box from the first day on, the second from the third day on, and the third from the seventh day on. As soon as the animal had reached the goal box, it was allowed to

Fig. 5.4 The effects of latent learning and of delayed introduction of reinforcement on performance level. Group 1 was given a food reward on every trial; in Group 2, on day 3 (at the points marked x); and in Group 3, the food reward was not introduced until day 7 (After Blodgett, 1929, p. 120)



eat for 3 min (under “food” conditions) or left in the goal box for 2 min before being removed (under “no-food” conditions). Figure 5.4 shows the rapid decrease in the error rate following the introduction of food in the second and third groups. Both groups immediately reached the performance level obtained by the first group, which had been reinforced from the outset. Tolman and Honzik (1930) later confirmed these findings.

These findings represent a case of learning without reinforcement. Hence, reinforcement cannot be a necessary condition of learning. Learning can remain latent, i.e., not necessarily immediately manifested in behavior. In this particular case, learning must have involved the acquisition of knowledge about the pathways in the maze rather than the establishment of fixed stimulus-response bonds, because the goal-oriented behavior, an efficient approach to the goal, did not occur prior to the introduction of food.

Performance of a learned response becomes observable only if it serves to achieve a goal, i.e., in the presence of motivation. Thus, Thorndike’s law of effect is not a principle of learning but of performance. Learning outcomes only manifest themselves in behavior in the presence of motivation and learning, both of which are separate conditional factors.

The goal-oriented motivational state can be enacted only through previously learned responses. That is shown by the difference in the performance of the second and third groups. Seven opportunities to explore the maze led to more efficient goal attainment than three such opportunities.

- Thus, behavior is explained by the interaction of two intervening variables, a learning factor and a motivation factor.

The learning factor, according to Tolman, involves knowledge about which path leads to the next maze segment. Under appropriate conditions, this knowledge leads to a goal expectation in the form of response-consequence contingencies. The motivation factor is the demand for the goal, which is dependent on the physiological need state or drive, and on the incentive value of the goal object (i.e., Tolman treated drive and incentive as more or less equal and did not consider their differential effects or interrelationships). Tolman’s two intervening variables, goal expectation and demand for the goal, are not only cognitive in nature but can also mediate between observable, antecedent conditions and subsequent behavior in a way that permits an explanation of goal-oriented behavior. Figure 5.5 illustrates the logic of this theoretical formulation.

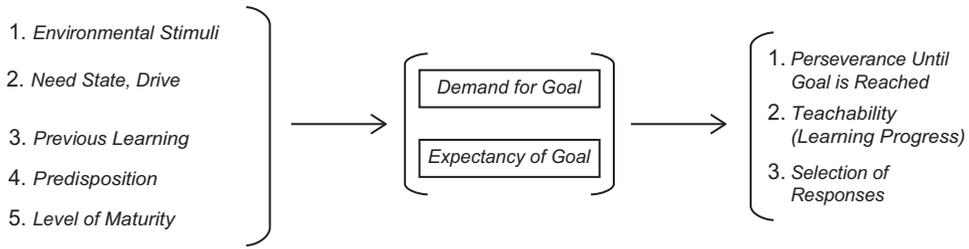


Fig. 5.5 Tolman’s theoretical construction of two motivational intervening variables: demand for the goal and goal expectation. The variables are conceived to mediate

between antecedent, observable conditions, and subsequently observable aspects of the goal directedness of molar behavior

Belief-Value Matrix

Tolman (1951, 1959) later expanded his theory of motivation to postulate that, apart from need states, there are two intervening cognitive variables that motivate a particular behavior, namely, belief and value. Value equals the incentive of the goal object, the other component of the demand for the goal alongside need (or drive). The two variables, belief

and value, are usually not independent but are linked within a “belief-value matrix” in established systems of beliefs. As a rule, there are a number of possible response-consequence contingencies ($R-S^*$) leading to the satisfaction of a particular need state, i.e., expectations about choices of action, on the one hand, and accompanying goal states (S^*) of varying value, on the other.

Example

This applies particularly in situations involving choices, e.g., a hungry person choosing between two restaurants serving food of differing quality and price on the basis of preferences and pocketbook. The choice between the restaurants and their respective menus involves not only anticipatory choices of action but also decisions about value. Figure 5.6 shows the belief-value matrix for a person in such a situation.

Tolman’s matrix implies an action sequence between the present hunger state (left) and need satisfaction (right). The circuitous lines with arrows indicate the action sequences contemplated; the size of the plus sign denotes the value of each restaurant (means) and the food served there (goal object). All four restaurants offer the most preferred dishes *a* and *b*, but items *c*, *d*, and *e* (although not *f*) would also gratify the person’s hunger.

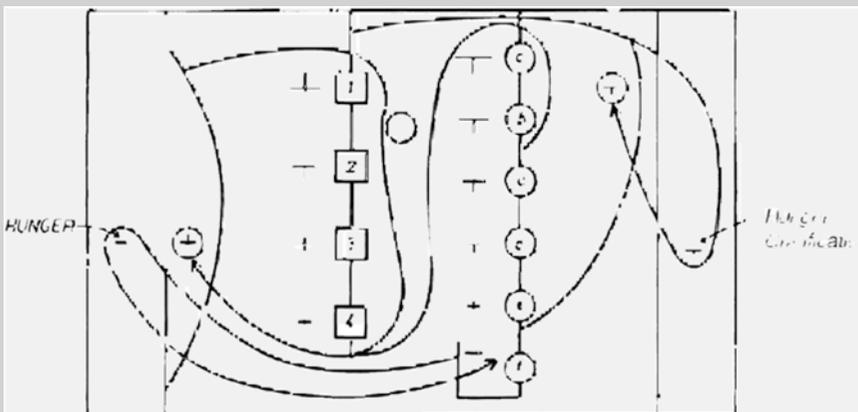


Fig. 5.6 Example of a belief-value matrix: cognitive anticipations in the choice between restaurants of different quality (and price) and different dishes in the presence of hunger (After Tolman, 1952, p. 392)

5.4.2 Hull's Learning Theory Conception of Motivation

Hull examined whether it was possible to explain motivation in terms of learned stimulus-response bonds, without reference to cognitive variables.

He was particularly interested in whether expectations can be conceptualized within S - R theory. Pavlov's data on classical conditioning, which had been translated into English at the end of the 1920s, offered some clues. Pavlov had shown that previously neutral stimuli could take on a signaling function for impending events. As can be seen in behaviors like salivation, these stimuli seem to create something that is analogous to "knowledge" about the future. There is anticipatory preparation for the actual goal response (eating), although the actual goal object (food) is not yet present. Therefore, there can be no goal response and certainly no goal state (satiation). If one now assumes that the response (R_1) that follows an external stimulus (S_1) brings about a proprioceptive feedback, i.e., results in an internal stimulus (s_1), then this inner stimulus can occur in temporal contiguity with the next external stimulus (S_2), which in turn elicits R_2 . Thus, s_1 immediately precedes R_2 and may be associated with it. In the long run, S_1 might suffice to elicit the entire chain of responses, mediated via the internal stimuli produced by these responses. Note that the strengths of the S_n - R_n bonds increase with greater proximity to the goal; the chain is assembled from the end. Figure 5.7a-d shows the stages of these associations via internal stimuli.

Thus, a response sequence can literally short-circuit itself via these self-generated, response-dependent, internal stimuli, which can maintain behavior independent of further external stimulation. A conditioned chain of responses of this kind can run its course very quickly, usually faster than the chain of stimuli that represent the changes in the environment in the run-up to the goal. The response sequence is faster than the stimulus sequence; R_3 occurs prior to S_3 . In other words:

- Events within the organism precede environmental events. This is how the organism can respond to something that has not yet occurred in reality. This is the theoretical basis for

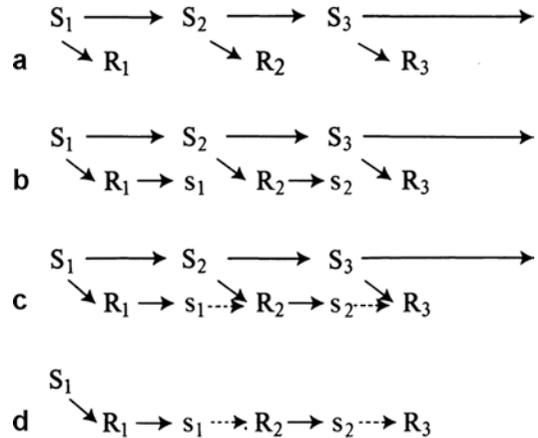


Fig. 5.7 (a–d) Basic pattern of how a response sequence (R_1 to R_3) can short-circuit itself via intervening, internal, i.e., response-dependent stimuli (s_1 , s_2), thus no longer requiring the external triggering stimulus

anticipation (cf. Hoffmann's concept of anticipatory behavioral control: Butz & Hoffmann, 2002; Hoffmann, 1993; Kunde, Koch, & Hoffmann, 2004).

Fractional Anticipatory Goal Responses

Along with internal stimuli (as proprioceptive feedback), Hull developed a further concept in his search for an S - R formulation of goal expectations that guide behavior. It was to become even more important to the development of his theory, particularly the part dealing with incentive effects. It concerns a salient group of pure stimulus acts: fractional anticipatory goal responses or r_G - s_G mechanisms. Like Freud before him, Hull assumed that a need state is accompanied by a drive stimulus (S_D) until it becomes satiated. Because the drive stimulus endures, it becomes associated with the whole sequence of responses leading to the goal response. Eventually, the drive stimulus is able to elicit the goal response immediately. It would be premature to trigger the full goal response at this point, however, because it would interfere with the necessary instrumental responses that lead to the goal and provide the basis for a successful goal response. According to the law of effect, such anticipatory goal responses would rapidly be extinguished. What remains is a fragment of the actual goal response, which does

not interfere with instrumental responses like biting, chewing, and swallowing (goal response), salivation, licking, and similar components of the eating process.

It is crucial that this fragmentary goal response (r_G) is elicited by the drive stimulus very early on and that it can, in one leap, bypass the entire chain of responses that has yet to lead to the goal response (R_G). Like all responses, it also results in proprioceptive feedback, S_G , an internal stimulus that Hull calls the goal stimulus. This internal goal stimulus represents the goal event, the satisfaction of the need. Like the drive stimulus, it is present during the entire behavior sequence, accompanying each intervening response. It can therefore serve as the basis for what Tolman called the goal expectation that anticipates behavioral outcomes and guides behavior toward its goal.

It was Crespi (1942, 1944) who provided experimental data showing that Hull's new $S-R$ theoretical formulations could not solve the incentive problem. Rather, he saw incentive as an independent motivational phenomenon. Crespi varied the amount of food given to a hungry rat at the end of a straight runway. Rats provided with more food ran faster in the first 19 trials than those given less food. Figure 5.8 shows how the plateau of running performance differs in the two incentive conditions. Under both conditions, maximum speed is reached after an equal number of trials, meaning that both groups must have acquired the same habit strength.

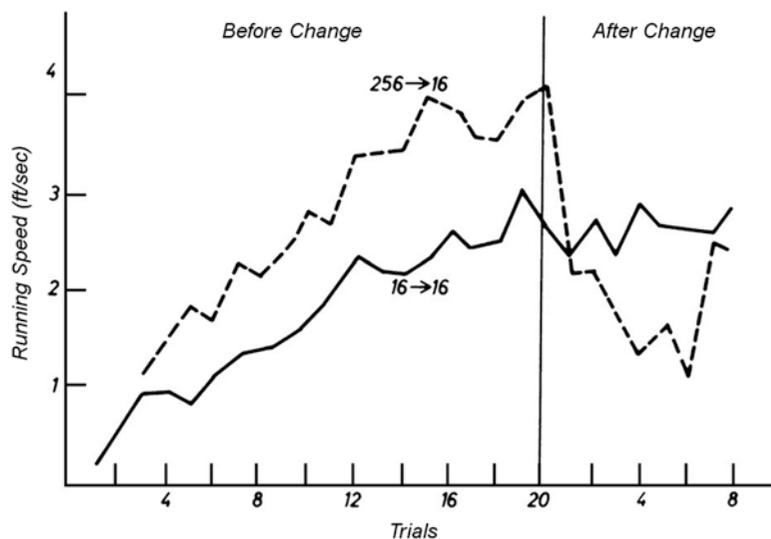
Thus far, the findings are congruent with Hull's reinforcement theory. Now, however, Crespi changed the amount of food dispensed to some of the rats. Figure 5.8 shows the effect of the change from too much to too little food. The high-reward group shows an abrupt decrease in running speed to the level of the low-reward group and even lower. This sudden change in behavior cannot be explained in terms of association theory. Crespi's findings were confirmed by Zeaman (1949), who found that reversing the amount of food reward from 0.05 to 2.4 g resulted in a complete reversal of latencies to the level of the high-reward group.

Spence's Extension of Hull's Model

Spence returned to Hull's original concept of the $r_G - S_G$ mechanism. According to Hull's conception, the fractional anticipatory goal response only becomes associated with the drive stimulus (S_D). Spence postulated that it also forms an association with external stimuli (S) and internal, proprioceptive stimuli (s). The anticipatory goal response can now be elicited by the corresponding stimuli and, in turn, serve as a motivator, i.e., increase the strength of the instrumental responses elicited by a particular situation. The anticipatory goal response has thus become an energizing incentive motivation.

Spence postulated that anticipatory goal responses could elicit tension states and conflicts that would have a general, nonspecific motivational effect. The true nature of the anticipatory

Fig. 5.8 Running speed as a function of the amount of food reward. For the first 19 trials, one group of rats was given 16 pellets, the other 256 pellets. From trial 20 on, all were given 16 pellets (After Crespi, 1942, Fig. 2, p. 488, Fig. 8, p. 508)



goal response remains clouded to this day. Attempts to observe and record it have been unsuccessful (cf. Bolles, 1967, p. 352ff.). Because Spence assigned to anticipatory goal responses the status of intervening variables, however, whether or not they are accessible to direct observation is arguably immaterial.

In contrast to Hull, Spence combined the two motivational factors D and K in an additive, not multiplicative manner, resulting in the excitatory potential (E ; which is equivalent to Hull's response potential, ${}_s E_R$; see also Chap. 2):

$$E = (D + K) \times H$$

A number of findings confirm the validity of this modification to the theory (e.g., Reynolds & Anderson, 1961). Another of Spence's modifications to Hull's model, however, was more decisive. Spence (1956) totally abandoned the reinforcement theory of habit formation. For him, the strength of an S - R bond was simply a function of the frequency of association, i.e., contiguity. Reinforcing events – their frequency, strength, nature, and their immediacy or delay – now contribute directly to the level of incentive motivation, K , which is manifested in the fractional anticipatory goal response ($r_G - s_G$).

This formulation provides a better basis for explaining incentive effects and latent learning than does Hull's earlier revision. The effectiveness of reinforcing events is no longer related to the gradual build up or decrement of habits. After all, it was precisely this sluggishness of the learning process that could not be reconciled with the abruptness of incentive effects. Now the change in incentive value, as manifested by the reinforcing events, is immediately imparted to all responses elicited by the situation via the motivating function of the $r_G - s_G$ mechanism. The $r_G - s_G$ mechanism itself is elicited by the relevant stimuli (external, proprioceptive, and drive stimuli), as in classical conditioning, as a function of their similarity with the actual goal stimulus (S_G). An increase in the temporal or spatial distance from the goal results in a stimulus generalization gradient, i.e., the relevant stimuli lose their similarity to the goal stimulus as distance increases, thereby resulting in a corresponding decrease in the motivational effects of the anticipatory goal

responses. Spence's extension of S - R theory into a theory of incentive motivation brings it very close to the conceptualizations of Lewin and Tolman. Viewed in terms of an S - R model, Spence's $r_G - s_G$ mechanism and Tolman's SR - S or R - S^* concepts are closely related.

5.4.3 More Recent Developments

There are many findings and other phenomena that have prompted researchers in motivation to give preference to incentive theories of one kind or another over drive and reinforcement theories (see the following excursus). An examination of the postulates of drive theory presented in Chap. 4 shows that several findings are equally or better explained by incentive theories. The findings of experiments attempting to differentiate among drives, where an animal is given choices corresponding to its relevant drive states, are one example. This choice behavior might be attributable to incentive effects, i.e., anticipatory goal responses, rather than to specific drive stimuli. The revisions of S - R theory by Hull and Spence raise the question of the extent to which energizing effects can be attributed to K .

Various sets of findings reported in Chap. 4 are consistent with Spence's idea that incentive effects result in increased activation. There must be a relationship between the strength of the consummatory response (R_G) and the strength of the instrumental response leading to it, because the latter is activated by the r_G , which anticipates the R_G . Sheffield, Roby, and Campbell (1954) confirmed this assumption. Their rats were rewarded with solutions of different sweetness and nutritional value (saccharin or dextrose). The results show an amazingly robust correlation between the amount of liquid consumed and running speed.

Walker's Analysis of the Explanatory Concepts of Learning Theory

Walker (1969) assigned the concepts of learning theory to four categories of hypothetical constructs:

1. Push: including explanatory concepts such as drive, motive, activation, tension, etc.
2. Pull: including valence, incentive, etc.

3. Structure: including cognitive organization, knowledge, habit, strength, etc.
4. Glue: including reinforcement in the sense of a hypothetical process that elicits and reinforces S-R bonds. Where reinforcement implies a goal state representing the satisfaction of a need, it belongs to the “pull” category, along with the concepts of incentive and valence.

Only three of the four categories of concepts are (or can be) manipulated by controlling the

antecedent conditions: push through deprivation of need satisfaction, pull through the established incentive value (attractiveness) of a goal object, and structure through previous experience, i.e., the number of learning trials. By contrast, response reinforcement represents a hypothetical process, taking place between two hypothetical constructs. In a manner of speaking, the pull concept exudes a kind of glue within the structure that bonds a response increasingly strongly to a stimulus. Figure 5.9 illustrates these relationships.

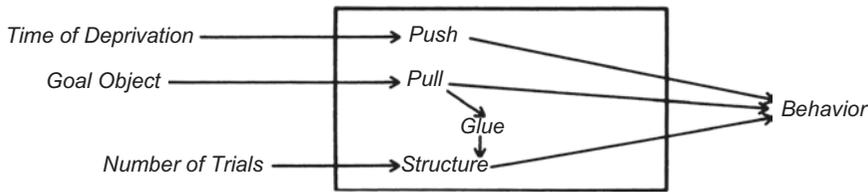


Fig. 5.9 Walker’s four categories of explanatory concepts of learning theory, one of which (“glue,” reinforcement) is superfluous (After Walker, 1969, p. 51)

Excursus

Sheffield’s Theory of Incentive Motivation

In his theory of incentive motivation, Sheffield goes one step beyond Spence and toward Lewin and Tolman. For him, incentive motivation has a specific, albeit somewhat indirect orienting function. Sheffield assumes that a need state in a situation that is not yet a goal situation can elicit a number of response tendencies. Via proprioceptive stimuli, these arouse fractional goal responses (r_G) of differing strength. The more this occurs in connection with one of the response tendencies, the higher the associated arousal level of that response tendency will become, until it finally brings about a situation in which the goal response (R_G) can occur.

This and similar arguments all lead to the two fundamental questions about the postulates of S-R theory that are raised by every theory of incentive motivation:

1. Is it really necessary to assume two motivational factors, drive and incentive, or can incentive encompass drive?

2. Is the postulate about the habit-forming effects of reinforcement not, in fact, superfluous?

With respect to the first question, drive remains as a variable of need state, but it becomes a determining condition for the strength of the incentive motivation itself.

Seward (1942, 1951) was the first S-R theorist to move in this direction. He spoke of the “externalization of drive” via r_G mechanisms of incentive motivation. Incentive motivation suffices to select and activate appropriate responses, which are elicited by stimuli that have formed an associative bond with the reinforcing goal response.

Two former students of Hull, McClelland and Mowrer, based their theoretical models on the motivating properties of “excitement,” which had previously been emphasized by Sheffield and Young. They endowed it with an emotional component, turning it into an emotion of expectancy. The positions of these authors are outlined in Chap. 2. In an abridged version of McClelland’s definition, motivation

is defined as an expectation of a previously experienced change in an affectively meaningful situation. This motivating expectancy is elicited by a stimulus cue that partially reactivates the earlier meaningful situation (cf. McClelland, Atkinson, Clark & Lowell, 1953).

Mowrer (1960) lists four types of emotions of expectancy (hope, fear, disappointment, and relief) that guide as well as activate behavior. Drive is no longer required, either for the reinforcement of instrumental responses, or for their activation, but it still retains one important function. Its reduction and its induction serve to condition the emotions of expectancy. External as well as internal stimulus cues can elicit these emotions. They intensify the sequence of instrumental responses occur-

ring in the run-up to the goal, increasing hope and decreasing fear. Thus, from the inception of a response, there are positive or negative expectancies, mediated by proprioceptive feedback and resulting in reinforcement or inhibition. However, in all this, Mowrer did not answer the question of how an instrumental response is activated before it is intensified or muted by an expectancy.

These and other concepts of incentive and expectancy, as well as their regulatory mechanisms, were incorporated in Heckhausen's (1963a) "systematic theory of motivation." This theory does not use the language of *S-R* theory; its central concept is the affectively charged "gradient of expectation," which is assumed to motivate approach or avoidance.

The question is now whether reinforcement as a "glue" concept is necessary for explaining changes in behavior. Does a behavior that is followed by reinforcement (in the sense of a need satisfaction) change more than a behavior that is not followed by such reinforcement? If so, can such change not be explained by the constructs of the other three categories of push, pull, and structure? Walker asserts that changes in structure (learning) can always be adequately explained by these three categories, making reinforcement as a glue a superfluous concept. For example, the disappearance of a learned response under conditions of extinction is most parsimoniously explained in terms of the absence of a previous incentive object. There is no longer any pull. Extinction is gradual because the incentive value of situational factors previously associated with the goal object has to be unlearned.

Walker cites a number of findings in support of the assertion that the glue construct is superfluous. Aside from the findings on latent learning and incentive change, he also points to findings showing that habit strength – contrary to the main postulate of reinforcement theory – does not remain at the same level under conditions of continuous reinforcement but decreases and eventually disappears. The response frequency approaches zero, despite the fact that each occurrence of the particular response has been reinforced.

- Walker not only sought to demonstrate that the glue effect of reinforcement remains unvalidated, he also pointed to the need to develop far more complex dependent variables to account for any glue effect between pull and structure.

Bolles' Cognitive Model of Incentive Motivation

Bolles, who was initially (1967) an adherent of the reinforcement view of motivation, later came to prefer a cognitive model based on incentive theory (1972). For him, reinforcement was neither a necessary nor a sufficient condition for instrumental learning. What is learned are not *S-R* bonds but two types of expectations:

- The first type of expectation relates to contingencies of external events and their consequences (*S-S**; i.e., stimulus-consequence contingencies).
- The second type relates to contingencies of one's own actions and their consequences (*R-S**; i.e., action-consequence contingencies).

The introduction of reinforcement simply provides an opportunity for the learning of both types of expectations. Bolles' model, which was derived

from *S-R*-oriented learning research, is more advanced than the other models and is largely congruent with cognitive approach theories of motivation. It is therefore worth examining this approach to the explanation of behavior, which Bouton and Fanselow (1997) label functional behaviorism, in more detail. In examining the reinforcement concept, we must first distinguish (as in Walker's critical analysis) between its two different meanings: reinforcement as an event (manipulated by the experimenter) and reinforcement as a process (habit formation), designated here as the "reinforcement mechanism."

Reinforcing events are often followed by behavior that looks like the kind of learning attributed to the reinforcement mechanism. There are numerous reports of observations, however, where this is not the case: either there is no learning following reinforcement or, conversely, learning occurs more rapidly or suddenly than can be accounted for by the reinforcement mechanism. Let us look at some of the evidence cited by Bolles. Breland and Breland (1961) reported reinforcement without learning effects in cases of what they called "misbehavior" in animals. Both Brelands were students of Skinner. They sought to apply the principles of operant conditioning to the training of circus animals (see example). These attempts met with remarkable difficulties and failures in various species.

Example

For example, a raccoon had learned to take a wooden coin to a piggy bank and deposit it there. This learned behavior broke down completely, however, when it was supposed to be carried out with two coins. Instead, a species-specific food-seeking behavior was initiated. The raccoon rubbed the two coins together, half inserted them into the piggy bank, and then pulled them out again. This behavior became so dominant that further training had to be abandoned.

One example of learning that occurs too rapidly to be attributed to the reinforcement mechanism is known as "autoshaping." As part of their training, many psychology students used to have to train a pigeon to peck a disc for a food reward. This can usually be accomplished within an hour by rewarding closer and closer approximations to the desired response. But more recent studies show that these students could have saved themselves a lot of effort. All one needs to do is to make the operation of the feeder contingent on the desired pecking response and to present the pigeon with food every now and then, regardless of what it is doing at that moment (Brown & Jenkins, 1968). Pecking, particularly pecking an optically distinct object, is a species-specific pattern of behavior and therefore has a high probability of occurrence. An explanation based on reinforcement theory could account for the gradually increasing frequency of the rewarded pecking response. But this explanatory model fails when the reinforcement conditions are reversed, as in the experiments by Williams and Williams (1969). Food rewards were given from time to time on a noncontingent schedule but never after the desired pecking response. Despite this, the frequency of unrewarded pecking responses increased and could not (or only to a limited extent) be brought under the control of reinforcement. The experimental animal responds in the same way as any other member of its species when it expects food, emitting need-specific responses that are part of its behavioral repertoire.

Bolles expanded these *S-R* conceptions into a different type of model, namely, a cognitive one. For him, the answer to the question of what is learned is not the pairing of *S* and *K* but of *S-S** and *R-S** in the form of expectancies. He formulated five corresponding laws of learning (see the following excursus).

All three determinants described in the "law of motivation" are multiplicatively combined in Bolles' model to predict the likelihood of a behavior occurring or its strength. This conception converges with the expectancy-value theories that emerged from other research orientations

(see below). What is new in Bolles' model is that it specifies two determinants of expectation: $S-S^*$ and $R-S^*$. These are distinguished on the basis of whether the goal event, represented by the value (S^*), occurs spontaneously ($S-S^*$) or requires an action ($R-S^*$) and in terms of their respective probabilities. This differentiation also provides the basis for causal attribution of action outcomes, which has a determining effect on motivational processes.

Does this imply that $S-R$ bonds play no role at all? Bolles sees these bonds as relevant in two contexts: first, in the innate response patterns of insects in the ethological sense and, second, in acquired behavior and skills that have become highly automated.

Bolles' model still needs to be refined in many respects. For example, Dickinson (1997) criticizes the theory's internal consistency. The interrelationship of the theoretical constructs requires further clarification, particularly the conditions under which $S-S^*$ and $R-S^*$ correspond. Moreover, the theoretical constructs have yet to

be empirically anchored. Any experimental testing of their predictive value will first require their quantification.

Bindra's Quasi-physiological Model of Incentive Motivation

Bindra (1969, 1974) proposed a model that is quite similar to Bolles' approach. He also rejected the $S-R$ postulate of response reinforcement, pointing out that learning can occur without opportunities for responding. When animals that have been administered curare, a poison that temporarily paralyzes the effector organs, are presented with an incentive object, they are unable to respond because of their paralysis. Once the paralysis has worn off, however, considerable learning gains become apparent (cf. Taub & Bergman, 1968). Imitation learning or modeling (Bandura, 1971) also seriously challenges the postulate of response reinforcement. The mere observation of a model's behavior evidently suffices to alter behavior significantly, without the observers themselves experiencing any form of reinforcement (cf. Bandura).

Excursus

Laws of Learning in the Form of Expectancies (Based on Bolles, 1972)

- Primary and secondary laws of learning:

The first two laws deal with learning. They define the two types of expectancies that constitute the essence of learning. The primary law of learning states that learning is a function of the formation of expectancies concerning new contingencies between environmental events. Newly emerging, orderly sequences of events are learned (in other words, stimulus-consequence contingencies). The stimulus signals an event that has significance to the organism, e.g., a potential need satisfaction or a threatening, painful goal object. The notation for this type of expectation is $S-S^*$. Organisms are evidently capable of comprehending not only predictable sequences of environmental events but also the relationship between their own action and its consequences

for the environment. Expectancies belonging to the class of action-consequence contingencies are subsumed under the secondary law of learning and are labeled $R-S^*$ expectancies. They can be observed in the manifold phenomena of instrumental conditioning. $S-S^*$ and $R-S^*$ correspond to Tolman's concept of expectancy ($SR-S$). It is useful to distinguish between the two, however, because it is possible for one type to already be in place in a new learning situation. It could either have been learned previously or have been innately present (see the law of preparatory experience below).

- Law of execution:

The third law – the law of execution – deals with how these two types of expectation interrelate and determine behavior. Syllogism provides an ideal model here: if $S-S^*$ and $R-S^*$ exist, then S^* can be achieved whenever S is present and R is initiated. A useful experimental investigation

would be to determine the extent to which various species (or individuals) are able to carry out such a syllogistic analysis of relationship, in terms of levels of complexity and complication. In any case, as shown by the findings on latent learning, initiation and guidance of behavior hinge on more complex processes than mere $S-R$ pairing. A cognitive theory postulates more exacting processes. Tolman employed the metaphor of a “cognitive map” to “explain” the goal orientation of actions.

- Law of preparatory experience:

The fourth law – the law of preparatory experience – incorporates innate and acquired expectancies of both types, which an organism may bring to a new situation and which may become dominant. These expectancies explain those situations in which the experimenter’s reinforcement procedures do not accomplish anything. This was, for example, the case in the study by Breland and Breland (1961) reported previously, in which once the to-be-learned behavior overlapped with a species-specific behavioral pattern, the learned behavior broke down and the raccoon reverted to the foraging behavior characteristic of the species. Experience has shown that there are

limits to learning that have to be drawn separately for each species. For mammals like rats, the limits soon become apparent when the reinforcing event is delayed: species-specific responses begin to intrude.

- Law of motivation:

Fifth and finally, Bolles formulated the law of motivation, which states that the likelihood of a response occurring increases with (a) the strength of the $S-S^*$ expectancy, (b) the strength of the $R-S^*$ expectancy, and (c) the value of S^* (Bolles, 1972, p. 405). All three determinants have a motivational component in S^* , a desirable goal (or – if S^* represents a threat – an existing or impending state that is to be changed or avoided). S^* , the value of the goal event, is analogous to Lewin’s valence or Tolman’s “desire for the goal.” It is independent of the need state, which corresponds to Hull’s D . $S-S^*$, the expectation that a situation will lead to a goal object or event, is equivalent to Lewin’s structure of the life space and to Hull’s K . $R-S^*$ gives direction to behavior in the presence of $S-S^*$. This corresponds to Lewin’s action path, Tolman’s expectations about means-ends relationships, and Hull’s purely associative habits.

The model does not include $R-S^*$ expectancies, because Bindra believes that these can be attributed to $S-S^*$. He argues that $R-S^*$ expectancies are not required because “the specific response form that emerges is a fresh construction created by the momentary motivational state and the spatio-temporal distribution of various distal and contact discriminative incentive stimuli in the situation” (Bindra, 1974, p. 199). This conceptualization is reminiscent of Lewin’s locomotion within the life space, which is free to follow the given forces and response choices within the field. Bolles (1972, p. 406) doubts the wisdom of excluding $R-S^*$ expectancies, because this would tie the subsequent responses too strongly to the behavioral repertoire of a given motivational state.

It would hardly do justice to the flexibility of lower mammalian, not to mention human, behavior. Aside from this point, however, the two authors are in general agreement on the basic issues. Bindra’s model is quite specific in many respects and has many physiological corollaries.

According to Bindra, motivation is never solely determined by either an organism’s need state or external, incentive stimuli but by a combination of both. The two aspects generate a “central motive state,” as had already been conceptualized by Morgan (1943). From a temporal point of view, primacy is assumed by the incentive objects in the environment.

They elicit the central motive state, provided there is a state of readiness for it (i.e., the

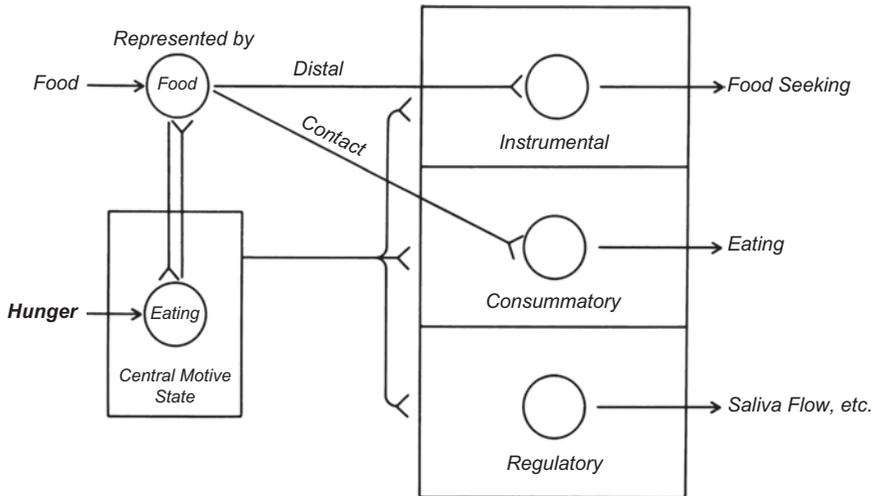


Fig. 5.10 Schema of Bindra's model of the motivation process and its influence on three different types of response, as exemplified by unconditioned food-seeking behavior

proprioceptive cues are compatible with it, and there is no other competing central motive state). One of the functions of the central motive state is to trigger and intensify sensorimotor functions that expedite approach (or avoidance) behavior. At the same time, it affects autonomic processes (like salivation during food-seeking) and increases the salience of an incentive object's central representation (in the brain). This leads to the mutual enhancement of the central representation of the incentive object and the central motive state.

Changes in behavior (learning) occur with the emergence of central representations of contingencies between situational stimuli and incentive stimuli. Some previously neutral situational stimuli are changed to conditioned incentive-related signals. Figure 5.10 shows the essence of the model. The arrows indicate the transition from observable events to nonobservable (hypothesized) processes. The forked lines represent the mutual effects of hypothetical variables. Bindra distinguishes between three types of responses:

- Instrumental (approach and avoidance)
- Consummatory (every response occurring at the point of contact with the goal object)
- Regulatory (internal, organismic responses, such as glandular secretions)

Bindra's model can also explain a number of phenomena and research findings that cannot meaningfully be explained by reinforcement theory.

5.5 Expectancy-Value Theories

There is probably no contemporary theory of motivation that does not incorporate some aspect of what is known as expectancy-value theory. Even theoretical approaches that emerged from completely different backgrounds converge in this respect, as Feather (1959a, 1959b) pointed out (see the overview in Feather, 1982; Wahba & House, 1974).

Before we present the most important theoretical models, let us briefly review the convergences that we have observed thus far in this chapter.

As early as Lewin's and Tolman's models, there were references to expectancy and value. Both authors made it quite clear from the outset that value was of pivotal importance to every theory of incentive motivation. For Lewin it was the valence, for Tolman the "demand for the goal." But Tolman was the first to postulate an expectancy variable. He introduced the concept to describe acquired knowledge about means-ends

relationships. Later, this evolved into a formalized value-expectancy theory in the form of the belief-value matrix. For Lewin, the expectancy variable remained at first embedded, even hidden, within the regional structure of the environment model, specifically in the perception of the appropriate action path leading to the goal region. Later, with the analysis of goal seeking and levels of aspiration (Lewin, Dembo, Festinger, & Sears, 1944), he introduced the independent concept of potency, the perceived probability of reaching the goal. This potency, along with the valence, determines the “effective force” or, in the case of setting levels of aspiration, the “resulting valence,” i.e., the choice of task. The theory of resulting valence is one of the expectancy-value theories (see below).

Traditional behaviorism originally had no use for such “mentalist” constructs as value and expectancy. Nevertheless, their functional equivalents can be detected under the cloak of *S–R* terminology. The value variable is inherent in the reinforcing experience, in the reduction of drive strength (*D*), and later in the incentive variable, *K*. The $r_G - s_G$ mechanism, the fractional anticipatory goal response developed early on by Hull, was invoked to explain how goal objects come to have incentive (*K*) effects on behavior. The anticipation of the goal object (s_G) incorporates the value variable. At the same time, the $r_G - s_G$ mechanism, through its associative bonding, embodies the expectancy variable, in that the feedback of a particular response (r_G) becomes associated with the representation (s_G) of the future goal event (S_G).

Drawing on Tolman or Lewin, the $r_G - s_G$ mechanism might easily have been conceptualized as a hypothetical construct for the “mentalist” process of expectancy. Hull, along with Spence and Sheffield, however, omitted to do so. Habit (s_H) had previously been the only directing structural component. But it no longer sufficed to explain the phenomena of latent learning and incentive change – both easily explained by Tolman’s expectancy component. Now, the $r_G - s_G$ mechanism denominating an incentive (*K*) was added to fill the explanatory gap. What applied to *D* also applied to *K*. Its activating effect is non-specific. According to Spence, it imparts all of its strength to all activated habits. The habit that has

been most closely conditioned to the goal response predominates.

Sheffield took this approach one step further in his theory of drive induction. After a few conditioning trials, premature goal responses will be triggered in the run-up to the goal. These result in nonspecific arousal, which in turn increases the response strength of the momentarily dominant habit. If, on the basis of previous learning, the dominant habits are those that lead to the goal, then hesitation and the testing of alternative responses at critical choice points must quickly lead to the identification of the right response, on the basis of increased arousal. As in Spence’s model, the activating effect of the fragmentary goal response is nonspecific, an arousing jolt, but it is imparted only to the relevant responses. In this respect, *K* indirectly attains a behavior-directing function in Sheffield’s conceptualization.

Mowrer finally overcame the behaviorists’ resistance to the expectancy construct, introducing expectancy emotions that direct behavior. Finally, Bolles made the greatest advance toward a cognitive model by combining two types of expectancy with a goal-related value variable (S^*), namely:

- Expectancies about situation-consequence contingencies ($S-S^*$)
- Expectancies about action-consequence contingencies ($R-S^*$)
- This evolution of the expectancy-value formulation within *S–R* theory gave it a cognitive character comparable to the cognitive theories of Lewin (1938) and Tolman (1959). In fact, it went beyond them in terms of conceptual precision.

5.6 Decision Theory

This model can be traced back to French philosopher and mathematician Blaise Pascal (1623–1662). When Chevalier de Méré asked him about the best strategy to adopt in a game of chance, Pascal’s advice was to opt for the game that offers the maximum product of potential winnings and probability of winning. In subsequent centuries, the matter of economically expe-

dient decisions acquired great theoretical importance in political economics. Under which conditions it is advisable to buy something; when is it preferable to save one's money (see the review by Edwards, 1954)? This theory assumed the consumer to be an "economic man" who:

- Is fully informed
- Can differentiate among an infinite number of alternatives
- Proceeds rationally

It gradually became clear, however, that economic decisions are frequently made in conditions of (partial) uncertainty about their consequences. Faced with various combinations of possible gains and their probabilities, people are expected to choose the one that yields the highest product of value and probability of occurrence. This product is termed the expected value. In fact, however, decisions related to purchases and games of chance rarely follow this mathematical equation. In place of this expected objective value, David Bernoulli (1738) proposed a subjective one, namely, expected utility.

Bernoulli tried to explain the general reluctance of people to choose a large payoff with a low probability of occurrence over a small payoff with near certainty, even when the expected value is mathematically the same for both – and why this reluctance to take risks lessens with increasing wealth. Bernoulli argued that the subjective value is not a linear but a concave function of the amount of money, i.e., that the subjective difference between \$10 and \$20 is greater than that between \$110 and \$120.

Based on this concept of expected utility, Neumann and Morgenstern (1944) developed a descriptive model of behavior that can be used to determine the utility function for a given individual based on subjective preferences. The individual is asked to choose between alternative combinations of utility and likelihood, and those alternatives that are considered to be equal are identified. If, for example, someone perceives a sure bet of \$12 to be equal to a 50% chance of winning \$20, then, for him or her, \$12 represents half the utility value of \$20.

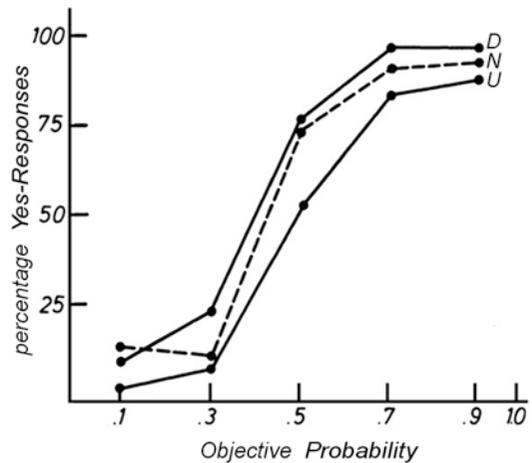


Fig. 5.11 Percentage of yes responses as a function of the objective probability of drawing a marked card under desirable (D), undesirable (U), and neutral (N) conditions (After Irwin, 1953, p. 331)

This model of behavior based on decision theory, in which the utility function is determined for each individual, has stimulated a great deal of research (cf. Edwards, 1962). Its application to psychology, i.e., to the prediction of actual behavior, however, has encountered many complications. Just as there are discrepancies between objective and subjective utility, there are also discrepancies between objective and subjective probability. For example, systematic distortions at both ends of the probability scale have been discovered.

- High probabilities are likely to be overestimated, while low probabilities are likely to be underestimated (Fig. 5.11). The term "subjectively expected utility" (SEU) is used to reflect subjectively expected probability and utility.

Complexities of Using Decision Theory to Predict Behavior

Even when working on the basis of subjective, rather than objective, probabilities, there are still clearly preferred regions of the probability curve when people are asked to choose between alternatives of equal subjective utility. Where the choice is between alternatives with increasingly higher payoffs and decreasing probability, combined in

such a way that the expected utility of all alternatives is the same, preference will still be given to a 50% probability. The case of negative utility, the chance of losing money, is a different one again. In this case, preference is for the lowest probability coupled with the highest potential loss.

In these cases, we are evidently dealing with psychophysical principles of risk-taking primarily investigated by Kahneman and Tversky in a series of experiments (cf. Kahneman & Tversky, 1984). The authors found that it is necessary to distinguish between gains and losses when determining value (in motivational terms, incentive), because the negative value of losing a sum of money is higher than the positive value of winning the same sum. In other words, the value function for losses is steeper than that for winnings. Hence, we can speak of loss aversion in cases where an individual is confronted with a loss and gain of the same value and with equal probabilities.

This irrational bias is consistent with two other inclinations, namely, a tendency toward risk avoidance in the winning sphere and risk seeking in the losing sphere. Both are predicted by the S-shaped value function, which is concave in the winning and convex in the losing sphere. In the first case, this means that if there is a choice to be made between a sure gain and a greater gain with a correspondingly reduced probability (mathematically equal objective value), there will be a reluctance to choose the latter alternative. In the second case, where the choice is between a sure loss and a higher loss with a correspondingly reduced probability (again with equal objective value), preference will be given to the latter. Since the risks of many decision problems can be classified as either positive or negative, i.e., slotted into a framework of possible gains or possible losses, the preferred alternative can often be determined simply by the way the issue is presented. The inclination to choose the more risky alternative decreases in the first case (gain) and increases in the second (loss).

The positive and negative values attached to an option can also change with differential perceptions of the circumstances, although there is no change in the probabilities associated with the risks. If, for example, the negative consequence

of a choice is seen as a necessary cost, the negative value will be lower than if it is seen as a loss. Conversely, positive consequences can decrease in value if other individuals are able to attain even more favorable consequences.

There are many other complications. It is possible that:

- Probability and utility are not simply multiplicatively linked.
- The probabilities of winning and losing are not complementary but have to be weighted differentially.
- The subjective probability of an event can change as a function of temporal delay (Milburn, 1978).
- The perceived probability of an event depends on its desirability and, conversely, its desirability depends on its probability.

With respect to the first type of mutual interaction of probability and desirability of an event, Irwin (1953) showed that positive events are perceived as more probable than negative ones. Students were asked to draw a card from a deck containing ten cards, of which either 1, 3, 5, 7, or 9 were marked. Students were awarded a point for drawing a marked card in the first two trials and deducted a point for drawing a marked card in the next two trials. For a control group, drawing a marked card had no positive or negative effect. Prior to each draw, participants were told how many of the ten cards were marked and asked whether they thought it probable that they would draw a marked card. Figure 5.11 shows the distribution of yes responses in relation to the objective probability of drawing a marked card for each of the conditions: desirable (point awarded), undesirable (point deducted), and neutral outcomes. Throughout, desirable outcomes were estimated to be most probable, followed by neutral, and finally undesirable outcomes. (Moreover, the graph shows a systematic overestimation of high probabilities and underestimation of low probabilities.)

Conversely, the desirability of an event or object can be influenced by the likelihood of its occurrence. That applies to all "scarce goods," including performance-dependent events. The more unlikely the success, i.e., the more difficult

the task, the higher the value assigned to that success. All of these complexities of predicting behavior on the basis of decision theory also present problems for the other expectancy-value theories, which will be examined in the next section.

5.7 Level of Aspiration and the Theory of Resultant Valence

The concept of level of aspiration has occupied an important position in the study of motivation since Lewin's student Fritz Hoppe presented his work on success and failure (1930). On the one hand, it implies a specific experimental paradigm; on the other hand, it is a hypothetical construct used in the theory of achievement motivation to explain individual differences in performance (Chap. 6).

Definition

As a hypothetical construct, level of aspiration implies the level of performance that will be acceptable to an individual's self-image.

As an experimental paradigm, level of aspiration defines the self-imposed and internalized level of performance communicated by a respondent to the experimenter with respect to a familiar task, which is now to be performed with some degree of mastery (Heckhausen, 1955, p. 119).

The typical procedure presents respondents with a task that can be performed more or less well and more or less quickly or with several tasks of varying levels of difficulty. After acquiring some insight into their performance level, respondents are asked to set a level of aspiration for each subsequent trial. This results in the sequence of events illustrated in Fig. 5.12.

Hoppe was interested in identifying the factors that determine whether a given level of performance is perceived as a success or a failure. It had been shown that the same performance can be perceived as success by one person and as failure by another. In other words, success and failure are not only dependent on the objectively defined level of difficulty of the task but also on the previously established level of aspiration. If this level is achieved or exceeded, the individual perceives success. If not, there is a feeling of failure. As shown in Fig. 5.12, the criterion for this self-evaluation is what is known as the attainment discrepancy, i.e., the positive or negative difference between the self-imposed level of aspiration and the actual performance. Feelings of success or failure affect the level of aspiration set for the next performance. Success generally results in an increased level of aspiration, failure in a decreased level, and not the other way round (this is called the "displacement rule"). Displacement of the level of aspiration upward or downward is a function of the intensity of the perceived success or failure, as was shown by Margarete Jucknat's (1938) data presented in Table 5.2.

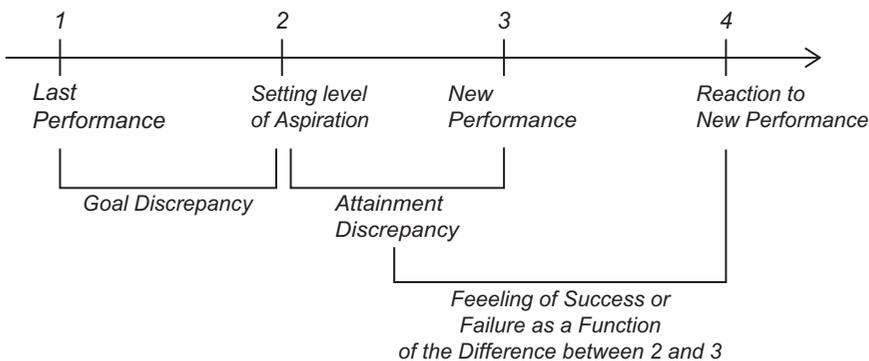


Fig. 5.12 Sequence of events in a level of aspiration experiment (After Lewin et al., 1944, p. 334)

Table 5.2 Percentage of upward and downward displacement of the level of aspiration as a function of the intensity of subjective success or failure

Displacement of the level of aspiration	After success			After failure		
	E!!	E!	E	M	M!	M!!
Upward	96	80	55	22	19	12
Downward	4	20	45	78	81	88

After Jucknat, 1938, p. 99

E!! very great success, *E!* great success, *E* no significant success, *M!!* very great failure, *M!* great failure, *M* no significant failure

Feelings of success or failure are concentrated at an intermediate level of subjective difficulty. Success on very easy tasks and failure on very difficult tasks have no effects on self-esteem. However, the more the mastery level exceeds previous performance, the more it will be perceived as a success. Conversely, the more it falls short of previous performance, the more it will be viewed as failure. This asymmetry of self-esteem is accompanied by an observable tendency to increase the level of aspiration following improvement in performance. The subjective perception of success does not increase with the level of aspiration, however, but remains more or less the same.

The crucial factor is the goal discrepancy, the difference between the last performance and the level of aspiration derived from it (Fig. 5.12). It shows a certain degree of individual constancy over time and may be positive or negative, i.e., the level of aspiration is always somewhat (or much) higher than the achieved level of performance or somewhat (or much) lower. One can usually observe a greater readiness to raise the level of aspiration after performance is significantly improved than to lower it after a decrement in performance. There is some – albeit weak – indication of this in Jucknat’s data presented in Table 5.2, in the case of very great success and very great failure. As an explanation of this general upward tendency, Hoppe introduced the concept of “ego level,” i.e., the tendency to maintain self-confidence at the highest possible level by adopting a high personal standard of performance. Later, this

notion became incorporated in the definition of the achievement motive, which is defined as the tendency to enhance one’s proficiency, or to maintain it at a high level, on all those tasks for which the individual has adopted a standard of excellence, and which can therefore lead to success or failure (Heckhausen, 1965, p. 604).

Aside from describing and explaining individual differences in the preferred goal discrepancy (which later become an important theme of achievement motivation research, Chap. 6), research on levels of aspiration also examined numerous intraindividual factors that result in pronounced upward or downward shifts in the goal discrepancy (see the example).

Example

If, for example, a task is endowed with greater personal importance, there will be a tendency to shift the level of aspiration upward, meaning that positive goal discrepancies become larger and negative ones smaller (cf. Frank, 1935; Ferguson, 1962). The same holds when goal setting is unrealistic and guided more by wishful thinking than by realistic expectations (Festinger, 1942). The introduction of a performance standard for a socially relevant reference group can bring about a conflict between individual and reference group norms (between one’s own and external performance standards), thereby influencing the setting of levels of aspiration (cf. Heckhausen, 1969, p. 158 ff.). Even the presence, prestige, and behavior of the experimenter or an audience can have an effect and may result in a splitting of the level of aspiration into one that is publicly stated and one that is privately held.

Overviews of research on the levels of aspiration can be found in Lewin et al. (1944) and Heckhausen (1965a, pp. 647–658).

5.7.1 Success Expectancy and Valence

The theory of resultant valence (Lewin et al., 1944), developed in the early 1940s, built on the general findings reported above to explain in more stringent terms why a shift in the level of aspiration occurs in specific cases. Level of aspiration is conceived here as a choice between several alternatives – either between tasks of various difficulty levels (task choice) or between different levels of performance on the same task (goal setting). In either case, it involves varying difficulty levels. Each level of difficulty has a positive valence in the case of success and a negative valence in the case of failure. As we saw earlier, the positive valence of success increases as a function of increased difficulty level, up to an upper limit, beyond which success is seen to be totally out of the individual's reach (e.g., an Olympic sprinter wanting to reduce his time of 10 s by 2 s in the 100-m dash). Conversely, the negative valence of failure increases with decreasing levels of difficulty. The easier the task, the more embarrassing it is to fail. Again, this holds only up to a point, after which the task is seen as mere “child's play” and failure blamed on the circumstances. By this logic, plotting the difference between the positive and negative valences at each level of difficulty should result in monotonically increasing valences as a function of increasing task difficulty. Likewise, the individual should always choose only the most difficult task that is still humanly possible. This is not the case, however. The choices always fall within a middle range, sometimes above, sometimes below the previous level of performance.

Another factor is clearly in force beside the valence, namely, success expectancy, the subjective probability of success or failure. Specifically, the valence of success increases as a function of increasing task difficulty and decreasing likelihood of success. This intuitive relationship was empirically confirmed by Feather (1959a, 1959b). He found that the positive valence of success (Va_s) must be weighted by the subjective probability of

success (P_s), because success on a difficult task may appear very attractive, but there is also an increased likelihood of failure. This is accounted for by computing the product of valence times probability, $Va_s \times P_s$, the weighted valence of success. The same applies to the negative valence of failure (Va_f) and the subjective probability of failure (P_f) on the same task, which give the weighted valence $Va_f \times P_f$. For any task, the probabilities of success and failure are complementary ($P_s + P_f = 1.00$). If the probability of success is 70%, the probability of failure is 30%. Hence, the formula for the resultant weighted valence (Va_r) is:

$$Va_r = (Va_s \times P_s) + (Va_f \times P_f)$$

There is a resultant weighted valence attached to each alternative task presented. Theoretically, individuals should choose the task with the highest sum of weighted success and failure valences.

If we know the success and failure valences and the probabilities for success and failure for each alternative in a series of tasks of varying difficulties, we can determine where level of aspiration ought to be set on the next trial. It may be set either above or below the previous performance level, depending on changes in the success and failure valences resulting from the subjective probability of success on the tasks in the series. Figure 5.13 shows a functional relationship, where the maximum resultant valence falls in the region of highest task difficulty, i.e., leads to a positive goal discrepancy in setting the level of aspiration.

Findings in neuroscience further qualify changes in valence due to experience on a neuromodulator level. Generally, a relationship between the release of the neuromodulator dopamine in the brain and motivation is postulated (Schultz, 2002). There is no dopamine release when the results of the behavior match the expectancies or fall short of them. If the results surpass the expectancies – that is, if the results are surprising – there is a strong release of dopamine (Abler, Walter, Erk, Kammerer, & Spitzer, 2006; Beck & Beckmann, 2010).

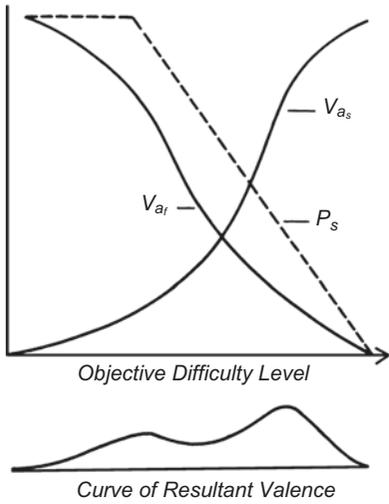


Fig. 5.13 Derivation of the curve of resultant valence from a set of functions for valence of success (V_{a_s}), valence of failure (V_{a_f}), and subjective probability of success (P_s) as a function of the objective difficulty level of a series of tasks (After Festinger, 1942 p. 241)

$$V_s = M_s \times I_s; V_f = M_f \times I_f$$

According to this definition of valence, success at a task judged by two individuals to be equally difficult should have a higher valence for a person with a high motive for success (M_e) than for a person with a low motive for success. A similar relationship holds for the failure valence, in the case of individuals with differing levels of the motive to avoid failure. In other words, with increasing task difficulty, the upward slope of the success-incentive gradient should become steeper as the strength of the motive to succeed increases (M_s) and the downward slope should become steeper as the strength of the motive to avoid failure (M_f) increases.

- This motive-weighted valence function of success and failure is the defining element of the risk-taking model. It is in this respect that the model goes beyond the theory of resultant valence and conventional expectancy-value theories.

5.8 Atkinson’s Risk-Taking Model

In 1957, Atkinson published an article entitled “Motivational Determinants of Risk-Taking Behavior,” which was probably the most cited publication in the field of motivation over the next 15 years. The model, designed to predict individual preferences for task difficulty levels, represents a logical extension to the theory of resultant valence proposed by Lewin et al. (1944). Atkinson added a person component, namely, individual motive strength, to the situational component of value and expectancy (see excursus on the next page).

Aside from assuming an inverse linear relationship between task difficulty and incentive (point 4 of the excursus), Atkinson’s crucial modification to the theory of resultant valence was to split Lewin’s valence variable, $Va(G)=f(t, G)$ (Lewin, 1938), into a situational component, incentive (I ; previously G), a function of task difficulty, and a person component, motive (M ; previously t , a motivational variable). He then reconstituted these components to form new valence constructs of his own, success valence (V_s) and failure valence (V_f):

One might reasonably expect this fundamental component of the theory to have been subjected to extensive empirical tests. Such testing has rarely been undertaken, however (Halisch & Heckhausen, 1988), one reason doubtless being the difficulty of operationalizing and measuring subjective probabilities.

Appending the subjective probability of success (P_s) and probability of failure (P_f) to the success and failure valence of a task – in a sense, a value calculation – gives the approach tendency of success (T_s) and the avoidance tendency of failure (T_f) for that task:

$$T_s = M_s \times I_s \times P_s; T_f = M_f \times I_f \times P_f$$

Success and failure tendency can be summed algebraically to obtain the resulting tendency (T_r) for a given task:

$$T_r = T_s + T_f \text{ or, in more detail,}$$

$$T_r = (M_s \times I_s \times P_s) + (M_f \times I_f \times P_f)$$

Because the failure incentive is negative, the failure tendency is also negative (or zero in the extreme case, where $M_f = 0$). Hence, Atkinson

viewed the failure motive as an inhibitory force. If the failure motive is stronger than the success motive, the resulting tendencies are negative at all levels of difficulty. Failure-motivated individuals should show a greater tendency to avoid a task as its resultant tendency becomes more negative. If they are set such a task, however, they should demonstrate increased effort and persistence (and possibly better performance) – at least, that is what Atkinson (1957) first postulated. Later he rejected this plausible assumption, which corresponds to Hillgruber's (1912) difficulty law of motivation, postulating – on theoretical but not empirical grounds – that a negative resultant valence not only inhibits the choice of a task but also the effort and persistence applied to it (Atkinson & Feather, 1966).

Predictions of the Risk-Taking Model

Given that the risk-taking model, like any postulate linking value and expectancy, was designed to predict choices or decisions only, it seems unreasonable to assume that the subtractive role of the failure tendency also applies to the parameters of task execution once work on the task has commenced (Heckhausen, 1984). To date, there is no empirical proof for this. On the contrary, it is quite plausible, as Atkinson (1957) himself originally assumed, that a failure tendency can have a positive effect on task performance, perhaps increasing effort to avoid a feared failure or to master the highest possible level of difficulty. (This effect has been confirmed in a number of studies; e.g., Heckhausen, 1963b; Locke, 1968.)

Excursus

Extending the Theory of Resultant Valence in the Risk-Taking Model

Atkinson's risk-taking model extends and revises the theory of resultant valence as outlined below:

1. The two expectancy-weighted values of success and failure are further weighted by person parameters of motive strength. The value of success is weighted by the motive to achieve success (success motive); the value of failure is weighted by the motive to avoid failure (failure motive).
2. In place of Lewin's concept of valence (which was a function of the need tension within a person, t , and the perceived nature of the goal object, G), Atkinson introduced the concept of incentive to reflect the value of success and failure. The incentive of success or failure on a specific task depends only on the perceived difficulty of that task and is not a function of a motive or motivational strength (such as t). Of course, as in the theory of the resultant valence, the perceived difficulty of a task is also person dependent, i.e., dependent on the extent to which the person feels

capable of carrying out the task (Atkinson, 1964, p. 254).

3. The subjective probabilities of success and failure are complementary. Probability of success (P_s) and probability of failure (P_f) add up to 1.00:

$$P_s + P_f = 1.00 \text{ (i.e., } P_f = 1 - P_s \text{)}$$

4. Value and expectancy do not vary independently of each other. The relationship between subjective probability and incentive is an inverse linear function that reflects everyday experience and empirical data indicating that the feeling of success increases as the perceived probability of success decreases, while the feeling of failure increases as the perceived difficulty of a task decreases (cf. Feather, 1959b; Karabenick & Heller 1976; Schneider, 1973, p. 160). Therefore, the incentives of success (I_s) and of failure (I_f) increase as a function of the decrease in the subjective probability of success (P_s) or failure (P_f), respectively:

$$I_s = 1 - P_s; I_f = 1 - P_f = -P_s \text{ (as } P_f = 1 - P_s \text{)}$$

Because success and failure incentives are dependent on the subjective probabilities of success and failure, respectively, and as these two probabilities are complementary, the risk-taking model can make predictions simply on the basis of the two motive parameters and the subjective probabilities. Accordingly, it is possible to express all probabilities and incentive variables of the resultant tendency (T_r) in terms of P_s :

$$T_r = M_s \times P_s \times (1 - P_s) - M_f \times P_s \times (1 - P_s)$$

or reduced:

$$T_r = (M_s - M_f) \times (P_s - P_s^2)$$

Because of the inverse linear relationship between the success incentive of a task and its probability of success, their product $-(1 - P_s) \times P_s$ is a quadratic function whose zero points are at $P_s = 0$ and $P_s = 1$ and whose maximum always lies at the intermediate probability of success ($P_s = 0.50$). It is a positive (approach) resultant tendency if the success motive is stronger than the failure motive and a negative (avoidance) resultant tendency if the failure motive is stronger than the success motive. Figure 5.14a-c shows the success

and failure tendencies as well as the resultant tendencies for a person whose success motive is twice as strong as the failure motive (Fig. 5.14a-c) and for a person whose failure motive is twice as strong as the success motive (Fig. 5.14a-c). Figure 5.14a-c shows that the resultant tendency becomes more pronounced with the dominance of one of the two motives (in this case, the success motive), i.e., that at each sequential step in the probability of success, the difference in the strength of the tendencies increases.

If, for a particular individual, the failure motive is dominant, then the resultant tendency between the success probabilities 0 and 1.00 is always negative. Such a person would theoretically try to get out of doing any task. Because such complete avoidance behavior is barely ever observed, however, Atkinson assumes that other motives, which are not achievement-oriented, may be at work, e.g., affiliation (to please the experimenter). These supplementary motivations persuade the individual to tackle the task despite the resultant avoidance tendency. The efficacy of additional motives is called “extrinsic tendency” (T_{ex}) and is added to the variables constituting the resultant tendencies:

$$T_r = T_s + T_f + T_{ex}$$

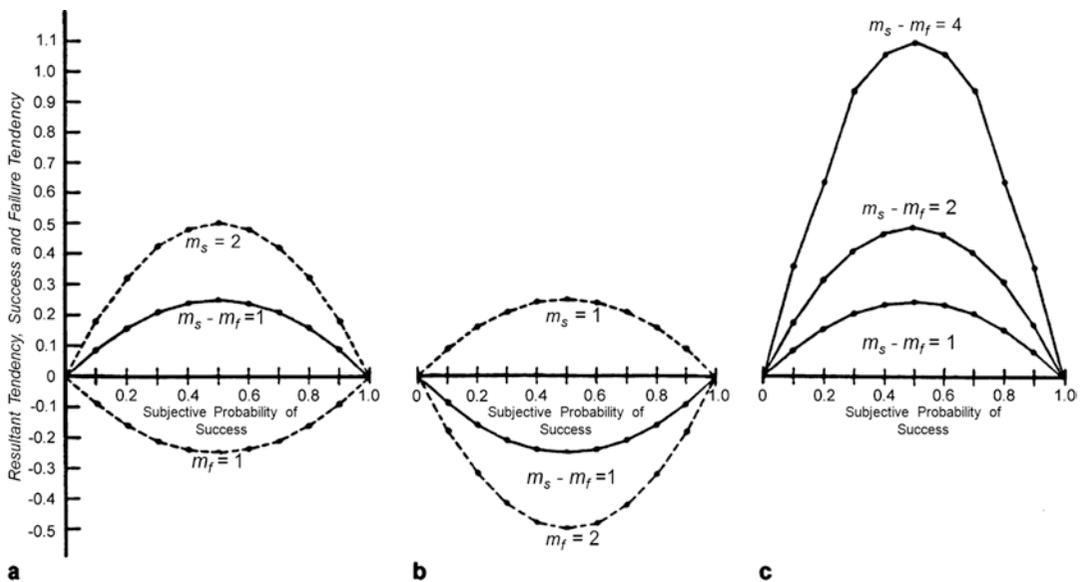


Fig. 5.14 Strength of the resultant tendency (and the success and failure tendencies – broken lines) as a function of subjective probability (a) when the success motive is stronger than the failure motive ($M_s - M_f = 1$), (b) when

the failure motive is stronger than the success motive ($M_s - M_f = -1$), and (c) for different individuals where the success motive outweighs the failure motive to varying degrees

Summary

The risk-taking model can be summarized in eight points.

1. It is designed for the “pure case” of a single, purely achievement-related task, i.e., where no other motives are aroused, and the task choice has no further consequences for the actor apart from a direct self-evaluative response to success or failure. The addition of extrinsic tendencies deviates from this pure case in that it specifies a supplemental condition that is not achievement-related. It is only with this addition that failure-motivated individuals can become motivated to approach a task goal.
2. The incentive for achievement behavior – i.e., the motivating agent of a resultant success or failure motivation – consists exclusively in the anticipation of an affective self-evaluation following success or failure (Atkinson speaks of pride or shame, respectively). Aside from these direct consequences, all further achievement-related consequences are ignored, including a superordinate achievement goal for which the present task outcome has something of an instrumentality. Similarly ignored are the incentives of ancillary goals with achievement relevance (except for the occasionally invoked extrinsic tendencies).
3. The incentive values of success and failure on the chosen task – restricted as they are to achievement relevance – depend exclusively on the subjective probability of success on that task. This means that, of the situational variables (expectancy and value), only the subjective probability of success needs to be considered in order to arrive at the weighted incentive (expectancy times value).
4. The risk-taking model applies only to tasks within the same class, i.e., tasks that can be differentiated solely on the basis of their objective probability of success. No prediction can be made for choices between diverse tasks with the same or different subjective probabilities of success. That would require consideration of further incentives related to the types of tasks (e.g., differences in personal importance).
5. Among the family of expectancy-value models, the risk-taking model is the first to contain motive, in the sense of an enduring personality variable. The success motive and failure motive of a person lend weight to the incentive of success and failure in a given situation (or – which amounts to the same thing – to the incentives already incorporated in this probability of success).
6. The failure motive is conceptualized as an inhibiting force, implying that the failure tendency ($T_f = M_f \times I_f \times P_f$) should always lead to an avoidance of task choice (Atkinson & Feather, 1966, p. 19).
7. The model’s three variables (motive, incentive, and probability) are mutually related in such a way that intermediate probabilities of success (tasks of intermediate difficulty) produce the strongest motivation to tackle the task, provided that the success motive is stronger than the failure motive. If, on the other hand, the failure motive outweighs the success motive, a task of intermediate difficulty is least likely to motivate, while a very difficult or very easy task should produce relatively high motivation – assuming that the task is not avoided altogether under this condition.
8. Although the risk-taking model was originally applied only to task choice, its application was later expanded to performance variables subsequent to such choices, including effort, persistence, and achievement outcomes. Neither theoretical nor empirical reasons were given for this. It was simply assumed that the maximum net difference between the success and failure tendency determines not only the choice of task difficulty but also task performance.

The risk-taking model has stimulated decisive research on achievement motivation, particularly research demonstrating that the preferred level of aspiration is motive dependent. Attempts have also been made to use the model to explain parameters of achievement behavior that are unrelated to task choice, e.g., persistence and achievement outcomes. Results were mixed, particularly when parameters of task performance and achievement were predicted. The model has been modified and

expanded repeatedly to account for results that are inconsistent with it or to explore new classes of phenomena. Revisions of the model are reviewed elsewhere (Heckhausen, 1980; Heckhausen, Schmalz, & Schneider, 1985). Some major problems (e.g., how to determine the probability of success) and related findings are presented in chapter on achievement motivation.

5.9 Rotter's Social Learning Theory

Julian Rotter (1954) assumed learned expectations about the relationship between one's actions and their reinforcing consequences to determine behavior, rather than unlearned and stimulus-response bonds resulting in nonspecific arousal. He chose the term social learning because "it stresses the fact that the major or basic modes of behavior are learned in social situations and are inextricably fused with needs requiring for their satisfaction the mediation of other persons" (1954, p. 84). According to Rotter (1954, 1955, 1960), a reinforcing event leads to an expectation that a particular behavior or circumstance will, in the future, result in the same reinforcement. Once reinforcement is no longer forthcoming, such acquired expectations about the contingencies of actions and their consequences will be unlearned, i.e., diminished or completely extinguished. Even a small child can increasingly differentiate behaviors in terms of their reinforcing outcomes. The more strongly one has experienced a causal connection between one's actions and a subsequent reinforcement, the greater will be the effect of a nonoccurrence of the expected contingency. Where the expectation is weak, however, nonconfirmation will have comparatively little effect.

This implies that each possible action alternative, in a given situation, has a specific behavior potential (BP). It is a function (1) of the strength of the expectancy (E) that the particular behavior in that situation (s_1) will lead to the specific reinforcement (R) and (2) of the reinforcement value (RV) of the reinforcement in that situation. Rotter's (1955) formula states:

$$BP = f(E \ \& \ RV)$$

In a given situation offering a number of action choices, the one with the greatest behavior potential (BP) will prevail. This construct corresponds to the Hullian reaction potential or Lewin's force. Expectancy and reinforcement value clearly correspond to the subjective probability and valence of success or failure, as defined by the theory of resultant valence. The only difference is that Rotter's conception makes fewer assumptions. For example, the relationship between expectancy and reinforcement value is not assumed to be multiplicative; it is left unspecified. Moreover, there are no a priori built-in relationships between the two variables, as is the case for probability of success and valence of success.

Rotter specified the constructs of expectancy and reinforcement values in more detail. The research initiated by his model has focused exclusively on the expectancy variable, however. It is a function of two independent determinants:

- The specific expectancy (E'), on the basis of past experience, that this particular behavior, in this particular situation, will result in a particular reinforcing event
- A generalized expectancy (GE) that has become generalized over a broad range of similar situations and behaviors:

$$E = f(E' \ \& \ GE)$$

Rotter's (1954) social learning theory might long have been forgotten had he not added the mediational link of generalized expectancy (GE) to facilitate the prediction of expectancy changes. The concept relates to an acting individual's beliefs about the occurrence of the reinforcing consequence being under his or her control. Rotter calls this dimension internal control of reinforcement. Generalized expectancies come into play when whole segments of life situations appear to be influenced either by one's own actions (internal control) or by external sources (external control). This probably reflects transient cultural beliefs and ideologies about the role of causal agents like fate, luck, or control by powerful others. Rotter assumes that expectancies about one's own control over reinforcement are highly generalized,

extending over all life situations and constituting a personality dimension. He developed an assessment procedure to measure this dimension: the Internal-External (*I-E*) Scale (Rotter, 1966). The individual's score reflects the generalized expectancy (GE). The scale has continued to play an important role in the research based on Rotter's social learning theory (Lefcourt, 1976; Phares, 1976; Rotter, 1966, 1982; Rotter, Chance, & Phares, 1972).

Empirical Support

Situation-specific expectancies about reinforcing consequences were induced in experiments involving skill-determined vs. chance-determined situations. These studies showed that situations perceived to be chance-determined are less likely to heighten expectancies of further success than

are situations perceived to be skill-determined. Likewise, there is less readiness to lower expectancies following failures. In the case of situations perceived to be chance-determined, there is also less readiness to generalize to other, similar situations. Findings related to resistance to extinction are particularly interesting, as they appear to contradict well-established findings from animal experiments, which show that intermittent reinforcement (in approx. 50% of acquisition trials) results in the strongest resistance to extinction. For humans, these results only emerge if the outcome of the task is perceived to be chance-dependent. If it is perceived to be skill-dependent, resistance to extinction after continuous (100%) reinforcement is higher than chance (50%) reinforcement, as shown by the findings of Rotter, Liverant, and Crowne (1961).

Study

Study on Resistance to Extinction as a Function of Specific Expectancies

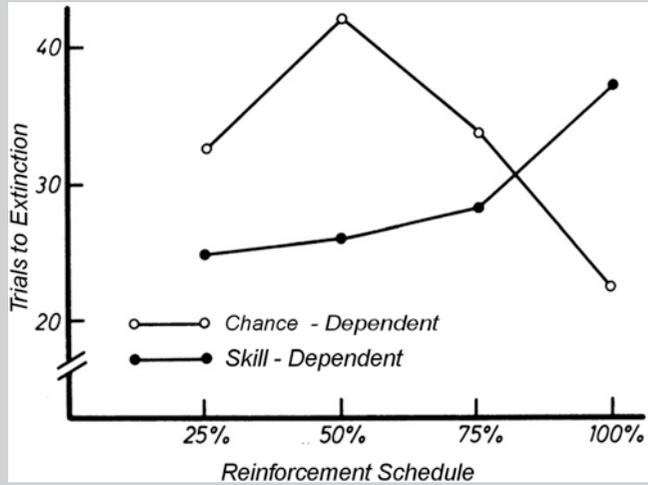
In the experimental study by Rotter et al. (1961), participants were asked to lift a board on which a ball was balanced without dropping the ball. This skill-dependent task was followed by a chance-dependent one involving extra-sensory perception. During the learning phase, the success rate was varied for both groups, to the extent that they received 25%, 50%, 75%, or 100% reinforcement. In the subsequent extinction phase (i.e., constant nonsuccess series), participants were asked to state, prior to each trial, the subjective probability of success. The extinction criterion was reached when the perceived probability was below 10%. Figure 5.15 shows the number of trials to extinction required for each of the different conditions.

What is the best interpretation of the data plotted in Fig. 5.15? The authors' suggestion that less information is obtained from the reinforcing event in chance-dependent tasks, and that there is consequently less learning than in the skill-dependent tasks, is not very convincing. Looking at the various conditions from the point of view of the study participants, another conclusion appears plausible. Where reinforcement is

dependent on skill, the increased success rate leading to a higher expectation of success is accompanied by a growing belief of having the skills necessary for the task at hand. The more firmly this belief becomes established, the more failures must be experienced to challenge and finally abandon it as individuals realize that they have either overestimated their skill level or underestimated the difficulty level of the task. This would explain the monotonic acceleration of the extinction curve as a function of the rate of success.

But what about the chance-dependent condition? A success rate of 50% will maximize the perception of a chance condition. Participants will never perceive an outcome to be chance-dependent if success is continuous. Instead, they will tend to suspect the experimenter of purposely manipulating the outcomes and will rapidly abandon all remaining beliefs in chance dependency during the extinction phase. With a 50% success rate, however, the belief in chance dependency becomes firmly established, and a greater amount of conflicting experience with 0% success is required before it is abandoned. Success rates of 25% and 75% are intermediate cases falling between the two extremes.

Fig. 5.15 Mean number of trials to extinction for a skill-dependent task and a chance-dependent task under four reinforcement schedules (After Rotter et al., 1961, p. 172.)



Rotter (1955) also specified the other determinant of the behavior potential, reinforcement value (RV), but this specification was not incorporated in the subsequent research generated by his model.

Reinforcement value *a* in situation 1 is a function of all expectancies that this reinforcement will lead to the subsequent reinforcements *b* to *n* in situation 1 and the values of these subsequent reinforcements *b* to *n* in situation 1. In other words, reinforcements do not occur entirely independently of one another, and the occurrence of one reinforcement may have expected consequences for future reinforcement (Rotter, 1955, pp. 255–256).

Reinforcement value, defined in this manner, can be represented by the following formula:

$$RV_{a,s1} = f \left[E_{R \rightarrow R(b-n)_{s1}} + RV_{(b-n)_{s1}} \right]$$

The idea that expectancies result from consecutive reinforcements (or valences) is the subject of instrumentality theory.

5.10 Instrumentality Theory

Helen Peak (1955) introduced the concept of instrumentality to the study of motivation to describe the expectation that an action outcome will bring about rewards (reinforcements).

Instrumentality plays a major role in explaining the relationship between attitude and motivation.

- The affective component of an attitude about a particular object or situation is a function:
 1. Of the instrumentality of that object or situation in attaining a desired goal
 2. The satisfaction to be gained from reaching that goal, which is, after all, dependent on motivation

In other words, an attitude can determine behavior. On the one hand, it incorporates a subjective probability that the value object can bring about the desired reinforcements (instrumentality); on the other hand, a certain level of satisfaction is expected from these reinforcements.

An index of the affective loading of a specific value object can be calculated by first multiplying the satisfaction value and instrumentality of each expected consequence of the value object. These products, called “derived affect loads,” are then added algebraically to obtain the affective loading of the value object in question. Figure 5.16 illustrates this procedure for the value object of removing racial segregation.

Numerous studies were conducted in the 1970s to test whether individuals who participate in sociopolitical activities are more likely to be categorized as “internals” on the *I–E* scale (see Sect. 0). Rotter, Seeman, and Liverant (1962)

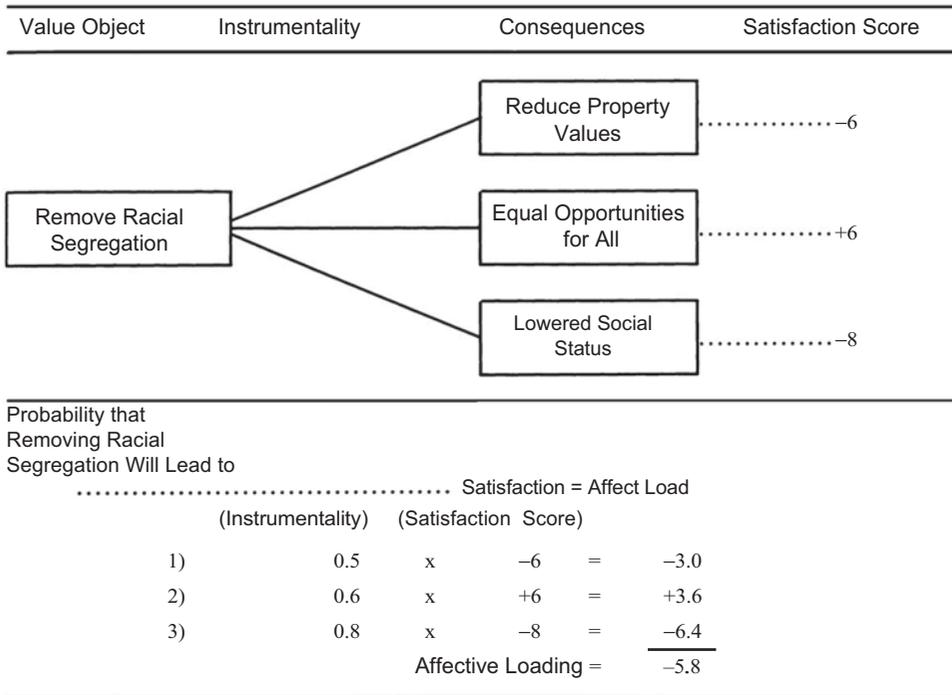


Fig. 5.16 Somewhat similar methods of combining indices of satisfaction and probability appear to have been employed more or less independently by a considerable number of people (After Peak, 1955, p.155)

had made this suggestion on the basis that “externals” are less likely to believe they can change the world. Klandermans (1983), in his literature review, contrasted this efficacy hypothesis with the power-formation hypothesis, which postulates on the contrary that “externals” experience a reduction in their characteristic feelings of powerlessness through sociopolitical activity. Of the 31 studies reported in the literature, only five confirmed the efficacy hypothesis and only four, the power-formation hypothesis. The criterion behavior of sociopolitical activists is evidently too complex to be a direct function of either an internal or an external control belief.

Peak’s expectancy-value model for determining the affective loadings of an attitude has been confirmed empirically. Rosenberg (1956), for example, was able to predict individual differences in attitudes toward the right of free speech for members of the Communist party, and toward the removal of racial segregation in residential areas, by asking participants to rank a set of value items in terms of their importance as sources of satisfaction and their perceptions of “the extent to which the value tends to be attained or blocked

through the instrumental agency of the attitude object” (p. 372). In a related study, Carlson (1956) was able to change an attitude by modifying the level of satisfaction to be derived from the removal of segregation. These approaches to attitude research were continued by Ajzen and Fishbein (1969), who examined behavior in response to actual and anticipated actions of a social partner.

Peak’s approaches were first adopted by the industrial psychologists Georgopolous, Mahoney, and Jones (1957) (see study below). Later, Vroom (1964) expanded and formalized them into an instrumentality theory. It is not coincidental that industrial psychology, with its applied approach, focused on the instrumentality of action outcomes. The expectancy of the various consequences potentially arising from an action outcome must necessarily play a decisive role in motivating behavior. Only the artificiality of the laboratory experiments that characterized basic research in motivation could have obfuscated the fact that there is an a priori assessment of the instrumentality of future actions and the desirable as well as undesirable consequences of their outcomes.

Study*Applied Research on Instrumentality Theory*

Georgopolous et al. (1957) postulated that labor productivity is dependent on the extent to which workers view their productivity as a means (a Lewinian “path goal”) of attaining important personal goals. The subjective instrumentality of high or low labor productivity for each of ten personal goals was determined for 621 workers in a factory producing household articles. On the basis of the reported importance of three of these goals – namely, “earning money in the long run,” “getting along with coworkers,” and “finding a better paying job” – workers were then assigned to one of two groups, one with high and the other with low valence (“need”). Labor productivity was measured in terms of exceeding or falling short of the production quotas set by management and communicated to the workers. The results confirmed the path goal or instrumentality approach. High productivity was associated with the belief that high productivity is decisive for achieving the three goals. Workers for whom these goals had greater personal importance (i.e., valence) were more likely to perceive such instrumentality.

Hence, labor productivity depends, on the one hand, on its instrumentality value for achieving overall goals and, on the other, on the importance (valence) of these goals for the individual worker.

valence will be chosen. This is accomplished by multiplying the expected valences of the potential outcomes of each action by the expected probability of their occurrence. These products are then summed algebraically, and the action alternative with the greatest sum is chosen.

To clarify Vroom’s instrumentality model, it is useful to make some distinctions that remain rather implicit in Vroom’s own work. Specifically, a distinction needs to be drawn between action, action outcome, and ensuing consequences (to be precise, the “consequences of action outcomes”; Vroom labels both “action outcomes”).

Whether a chosen action will lead to the desired outcome is more or less probable. In other words, the subjective probability of success can vary between zero and one. (Vroom uses the term “expectancy” (E) rather than subjective probability.) Once a particular action outcome has been achieved, it can have more or less appropriate, desirable, or undesirable consequences. On the positive side, it may imply support from coworkers, praise from supervisors, a promotion, or pay rise. Vroom does not use the term “probability” to designate the various coefficients between action outcomes and their consequences, as one might have expected. Instead, he uses the term “instrumentality,” based on the idea that a given outcome may precede not only the desired consequence but also its opposite. As such, the respective coefficients can range from -1 to $+1$, rather than just from zero to one. Vroom defines a positive, a neutral, and a negative instrumentality of an “effective performance” for outcomes with positive and negative valence as follows:

Definition

If effective performance leads to attainment of positively valent outcomes or prevents the attainment of negatively valent outcomes, then it should be positively valent; if it is irrelevant to the attainment of either positively or negatively valent outcomes, it should have a valence of zero; and if it leads to the attainment of negatively valent outcomes and prevents the attainment of positively valent outcomes, it should be negatively valent (Vroom, 1964, p. 263).

5.10.1 Vroom’s Instrumentality Model

Vroom (1964), in the tradition of expectancy-value theories, combined instrumentality and valence multiplicatively. Valence here means no more than the perceived value of the outcome of an action. The higher the product of valence and instrumentality, the stronger the emerging motivation or action tendency. If there is a choice of alternative actions with equivalent instrumentality, the one with the optimal

For example, if an action outcome results in a negative consequence, it will have a positive instrumentality for a negative consequence. Because the product of instrumentality and valence is negative, the action will not be initiated. However, if the outcome serves to avoid a negative consequence, both the instrumentality and the consequence will be negative. Their product will thus be positive, resulting in a positive action tendency (see the example).

Example

An example here would be a student's fear of failing the year (negative consequence). He is aware that redoubling his efforts in the final weeks of the school year might prevent the feared event from occurring (negative instrumentality of not being promoted to the next grade). Hence, he will put more effort into his school work. In this case, a fear-related arousal leads to an increase in motivation. If instrumentality, like expectancy, varied only between +1 and 0, instead of between +1 and -1, the student's fear of failing the year would result in inactivity, because the product of instrumentality (expectancy) and negative consequences would always be negative.

Generally speaking, the latter approach would imply that fear motivation always leads to a reduction in the action tendency. As we have seen, this is the premise of Atkinson's risk-taking model, in which negative incentives are multiplied by the probability of success (0 to 1). Thus, the fear-related component within the risk-taking model is always negative and always has an inhibitory effect on the resulting action tendency.

Instrumentality, therefore, always concerns the relationship between an action outcome and the ensuing consequences. More generally speaking, it concerns the relationship between the direct outcome of an action and the associated indirect, subsequent effects.

This aspect of action-consequence contingencies has characteristically been overlooked by

experimental laboratory research. After all, once the intended action outcome has been achieved, the respondent has completed the imposed task. Activities in the laboratory represent a restricted episode, without further consequences for the manifold life goals of the respondent (save perhaps the desire to make a good impression on the experimenter). It is assumed that there is a valence inherent in the outcome. In Vroom's model, this would mean that a successful outcome always has a full instrumentality of +1, with "rewards" that possess valence characteristics for the individual respondent (e.g., a feeling of satisfaction with their achievement or other action consequences). The same applies to Atkinson's risk-taking model. Like other expectancy-value models, its expectancy component does not encompass instrumentalities. It is limited to the likelihood that one's actions will lead to the intended outcome. This is identical to Vroom's expectancy (E). It is the type of expectancy that Bolles called action-outcome contingencies ($R-S^*$), which represent the probability coefficient between one's own efforts and the outcome dependent on those efforts.

5.10.2 The Three-Component Model of Valence, Action, and Performance

Valence Model

As became clear from the discussion above, the valences of potential consequences of actions play a significant role. Collectively they determine – along with their specific instrumentality – the valence of the action outcome.

- The valence of the expected action outcome, therefore, is a function of the valences of all further consequences of the action and of the instrumentalities attributed to the action outcome for their occurrence.

The product of valence and instrumentality is computed for each action consequence, and these products are then summed algebraically. The action outcome itself has no valence, rather it

acquires valence in anticipation of its potential consequences. This relationship can be represented as follows:

$$V_j = f \times \left[\sum_{k=1}^n (V_k \times I_{jk}) \right]$$

where V_j = the valence of the action outcome j , V_k = valence of the action consequence k ; I_{jk} = the expected instrumentality (-1 to +1) of the action outcome j for the occurrence of the action consequence k .

This valence model can serve to explain an individual's assessment of a situation, provided that there has already been action of a specifiable strength in a particular direction or that action outcomes are already in place. That explains why the model has been used almost exclusively to study job satisfaction (Mitchell & Biglan, 1971).

Action Model

The valence model cannot explain which of several action alternatives will be chosen in a particular situation and with what intensity that alternative will be carried out. Like all other expectancy-value theories, such predictions would require consideration of the likelihood that the action will lead to the desired outcome. This is why the instrumentality model of motivation multiplicatively links the expectation that an action will lead to a particular outcome with the valence of that outcome (derived in the manner

described above). From this, the resultant action tendency in a choice situation can be derived. Drawing on Lewin's field theory, Vroom labels it the psychological force (F). Expressed as a formula:

$$F_i = f \times \left[\sum_{j=1}^n (E_{ij} \times V_j) \right]$$

where F_i = the psychological force to perform act i ; E_{ij} = the strength of the expectancy (0 to 1) that act i will lead to outcome j ; V_j = the valence of outcome j .

In contrast to the valence formula, this formula represents an action model rather than an assessment model for measuring aspects such as job satisfaction. It can explain behavioral differences in performance situations and has been used by industrial psychologists to study productivity or job performance. Vroom (1964) used the model to systematize and analyze a multitude of empirical findings relating to occupational choices, worker turnover, effort, and productivity, thus confirming the explanatory validity of the model. A summary of basic concepts is presented in Fig. 5.17.

Strictly speaking, the action model of psychological force (F) does not predict the action outcome. Vroom himself emphasizes that it predicts the amount of effort invested in the pursuit of a goal. Action outcomes (e.g., job performance) can be interpreted by this action model only

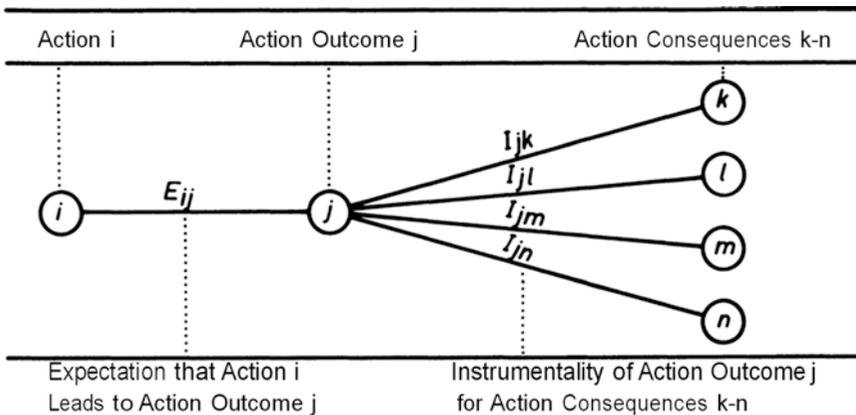


Fig. 5.17 Schema of the variables in Vroom's instrumentality model

insofar as they are dependent on the amount of effort (motivation) but not on other factors, e.g., task-relevant skills. Here, Vroom anticipated an important idea that was later elaborated in causal attribution theory: the motivational process consists, to a large extent, of a calculation of effort (Kukla, 1972; Meyer, 1973; see also Chap. 14). Different levels of required effort can lead to different levels of action outcomes, and these in turn can lead to consequences with varying valences. According to Vroom, the amount of effort is a function of the algebraic sum of the products of the valences for each level of the action outcome and of the expectancy that each outcome level can be achieved by a particular amount of effort.

Performance Model

To predict the action outcomes actually attained, Vroom (as well as Lawler & Porter, 1967) proposed a third model, the performance model. It states that the attained outcome is a function of a multiplicative relationship between competence and motivation, i.e., psychological force. In other words, action outcome = $f(\text{competence} \times \text{motivation})$. If we now replace motivation (M) with the action model's formula for psychological force (F), we obtain:

$$\text{Action outcome} = f(\text{competence}) \times \left[\sum_{j=1}^n (E_{ij} \times V_j) \right]$$

Individual differences in competence have thus far been largely overlooked (cf. Gavin, 1970). They have not played a significant role in the interpretation of the variance of action outcomes, either by themselves or in conjunction with psychological force (Heneman & Schwab, 1972). This is probably because job performance was assessed by objective psychometric tests rather than self-reports (after all, expectancy, instrumentality, and valence are all subjective in nature).

Action Outcomes and Their Consequences

The fact that Vroom (1964) omitted to distinguish between action outcomes and their consequences led to some confusion between the various levels of outcomes. In fact, these different outcome lev-

els are temporally staggered and are distinguished by their instrumentality for subsequent "outcomes." Galbraith and Cummings (1967) differentiated between level and level outcomes:

- Level Outcomes:
- According to these authors, a level outcome is one for which an investigator wishes to determine the valence.
- Level Outcomes:
- These include all events that have instrumental meaning for the level outcome and whose valence therefore determines the valence of the level outcome.

Less ambiguous, and arguably psychologically more appropriate, would be our distinction between action outcomes (level outcomes) and action consequences (level outcomes). This distinction raises the question of whether an action outcome receives its valence only through its consequences or whether it has its own valence. The latter is often referred to as intrinsic valence. In this case, the action outcome is more or less directly tied to significant experiences within the acting individual, without the mediation of any external factors. These experiences are based on self-evaluative processes occurring both during an action and after its outcome. Mitchell and Albright (1972) differentiated five types of intrinsic valences.

Intrinsic and extrinsic valences (Based on Mitchell & Albright, 1972)

- Intrinsic valences:
 1. Feelings of self-worth
 2. Opportunity for independent thought and action
 3. Opportunities for self-development
 4. Feelings of self-actualization
 5. Feelings of appropriate accomplishment
- Extrinsic valences:

These involve external factors, i.e., action consequences mediated by external forces:

 1. Authority
 2. Prestige

3. Security
4. Opportunity to make friends
5. Salary
6. Promotion
7. Recognition

In contrast to the approach taken by Galbraith and Cummings, it might appear reasonable to conceptualize all externally mediated events having extrinsic valences as level outcomes (action consequences) and all events characterized by intrinsic valences as level outcomes (action outcomes). This distinction is also questionable, however, because events with intrinsic valences do not coincide with the accomplishment of a particular action outcome but are themselves the result of self-assessment processes as a reaction to the desired outcome. Thus, the same action outcomes can have different intrinsic values to the same individual, depending on the extent to which they are attributed to one's own proficiency, to luck, or to the help and support of others.

Furthermore, it is possible that events with external valence (action consequences) serve to initiate self-assessment involving intrinsic valences. A further distinction between level and level outcomes is made by Campbell, Dunnette, Lawler, and Weick (1970) in their hybrid expectancy model. They refer to the outcome of an action as the task goal, which has an expectancy

I. Attainment of the task goal leads, with an expectancy, to outcomes of the first level with reward characteristics. Their valence is a function of their instrumentality for the satisfaction of needs, and this satisfaction of needs represents level outcomes. This would mean that all action consequences possessing valence would be level outcomes. They can be categorized in terms of the needs assumed to underlie them. What remains is the difficulty of defining level outcomes, i.e., of distinguishing between various needs and measuring their satisfaction.

Empirical Investigations

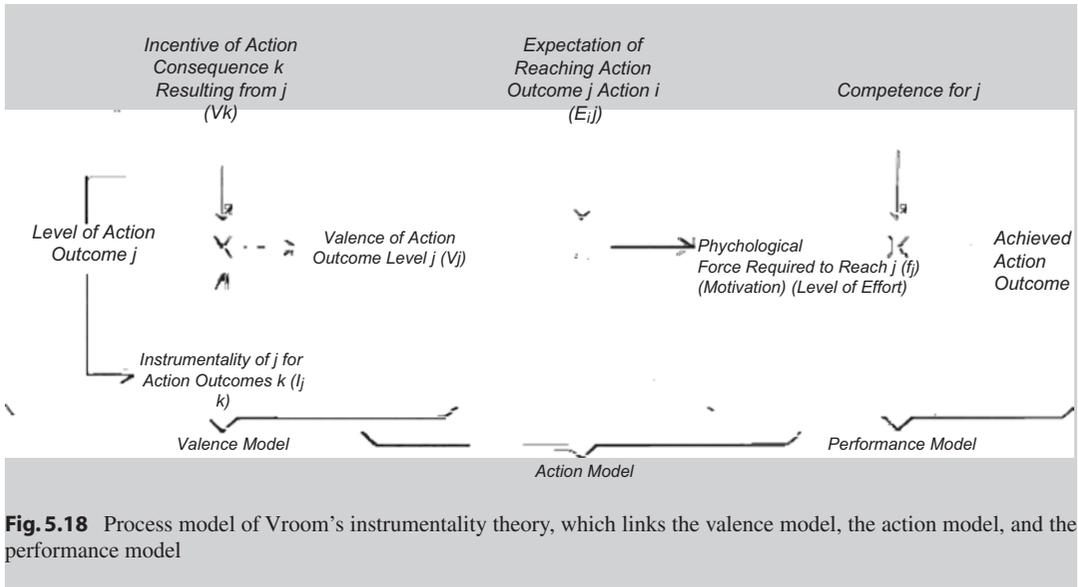
Vroom's instrumentality theory has proved fruitful for research. It generated a whole series of field studies, most of which confirmed the valence and action models. These models have also been expanded by the addition of variables such as work role, which describes the perceived and assumed demands of the workplace, e.g., expenditure of effort, and which, along with psychological force and competence, is assumed to determine the action outcome attained (Graen, 1969; Porter & Lawler, 1968). Critical reviews have been published by Mitchell (1974, 1982), Mitchell and Biglan (1971), and Henemann and Schwab (1972). Wahba and House (1974) discussed the theoretical and methodological problems (see also Semmer, 1995).

Excursus

Vroom's Instrumentality Theory: Three Models in One

Vroom formulated three models: the valence, action, and performance. These three models can be combined to form a process model (Fig. 5.18). This process model contains the individual components determining the valence of the desired action outcome (valence model), the psychological force behind the action (action model), and finally the action outcome achieved (performance model). The process model begins with the interaction between the valence of

the action consequences and the instrumentality of the action level for this valence, which results in the valence of the corresponding action outcome level. This valence interacts with the expectancy that a particular action outcome can be achieved by the action, which results in the psychological force behind the particular action, i.e., the readiness to apply the necessary level of effort. It can also be called the strength of the action tendency or motivation. Finally, the product of psychological force (effort) and level of competence will determine the action outcome achieved:



- In general, it has been shown that the multiplicative relationships postulated in Vroom's model are more valid than the additive relationships.

For example, Mitchell and Albright (1972), using the valence model (i.e., the multiplicative combination of valence and instrumentality), were able to account for half of the variance ($r = 0.72$) in the job satisfaction scores of a sample of navy officers. This general rule does not always apply, however, either to the interaction between the valence of the consequence of an action and the instrumentality of its outcome or to the interaction between expectancy and the valence of its outcome (cf. Pritchard & Sanders, 1973). In earlier investigations, instrumentality and expectancy were generally not analyzed separately, as required by the model. The two could therefore be confounded, e.g., in studies attempting to determine the degree of relationship between effort and consequences (e.g., Hackman & Porter, 1968); in studies confounding that relationship with the one between action outcomes and action consequences, i.e., instrumentality (e.g., Gavin, 1970; Lawler & Porter, 1967); or in studies where perceived instrumentality is based on indirect estimates (e.g., Galbraith & Cummings, 1967; Georgopolous et al., 1957; Goodman, Rose, & Furcon, 1970).

All of these studies can be criticized for their operationalizations of the constructs, particularly

where instrumentality is concerned. A pertinent example is the study by Pritchard and Sanders (1973), who studied postal workers taking a letter-sorting course that required them to memorize long and complex routes. The valences of 15 different consequences were to be evaluated (e.g., “keeping the job and not getting fired” and “getting a raise,” along with more negative valences like “being assigned more work” or “having to work overtime”). The instrumentality scores (I), however, were not operationalized in accordance with the model. They consisted of ratings ranging from +1 to +10 that learning the course material would lead to the 15 consequences. The dependent variables were estimates of the amount of effort invested in the course. (Self-assessment of expended effort appears to be the best measure of the dependent variable, as most of the course program was completed at home.) The best predictions were obtained for the following components of the valence and action models involving multiplicative or additive interrelationships:

$r = 0.54 V$	(Valence)
$0.52 V \times E$	(Valence times expectancy)
$0.50 V \times 1$	(Valence model, multiplicative)
$0.49 E + (V \times 1)$	(Action model, additive)
$0.47 E \times (V \times 1)$	(Action model, multiplicative)
$0.41 V + I$	(Valence model, additive)
$0.36 E + (V + 1)$	(Valence and action model, additive)
$0.22 I$	(Instrumentality)

The multiplicative valence model seems to be somewhat superior to the additive one (0.50 vs. 0.41), but the same does not hold for the multiplicative and additive action models (0.47 vs. 0.49). The instrumentality measures, whose operationalization is not consistent with the theory, account for little of the variance but reduce it somewhat when I is added to the other variables. Admittedly, the scale levels of the variables are not suitable for determining whether an additive or multiplicative relationship is more appropriate (Schmidt, 1973).

A further problem consists in the number and types of action consequences to be taken into account by the investigator. Individuals differ in the number and types of action consequences that have relevance for them. Because measures of valence and instrumentality are based on the action consequences chosen by the investigator, there may be an undue restriction of the individual variance in valence and instrumentality, because important consequences are ignored. But if the number and types of consequences are determined for each individual case, then interindividual comparability might be jeopardized by the algebraic summing of all products of valence and instrumentality, as required by the model.

To date, investigations within the framework of instrumentality theory have largely involved field studies in the workplace. Admittedly, this provides them with a high external validity compared with artificial laboratory experiments. There is one disadvantage, however. It is impossible to carry out a causal analysis of simultaneously observed variables without systematic variation of those variables that are presumed to be the determinants. Lawler (1968) thus extended his investigation of 55 industrial managers over a whole year. The valence data consisted of an estimate of the importance of six stated consequences of actions. As mentioned above, his instrumentality data were confounded with expectancy. Participants were asked to estimate the extent to which their own efforts and action outcomes might lead to six action consequences. The actually attained outcomes (dependent variable) were assessed 1 year later, by means of evaluations by colleagues and superiors and self-evaluation. Multiple correlations between the product of "instrumentality" \times valence and the attained action outcome after 1 year ranged between 0.45

(colleagues' evaluation), 0.55 (supervisor's evaluation), and .65 (self-evaluation). As the correlation of the independent variables and the dependent variables assessed 1 year later was higher than the correlation between the variables obtained at the beginning of the study, the findings suggest a causal dependence of the performance scores attained, as predicted by Vroom's valence and action models.

The concept of instrumentality introduced an expanded version of the expectancy-value model that has seen widespread use in theoretical and applied research on work motivation (cf. Kleinbeck, 1996; Mitchell, 1982). The expectancy-value theories take a variety of forms in the literature on work motivation (Kanfer, 1990). In this context, additional components are considered. Isaac, Zerbe, and Pitt (2001) proved that individuals feel motivated when they perceive that effort will lead to an acceptable level of performance, that the performance will lead to some outcome(s), and that the outcome(s) are personally valued. In an academic setting, Chen and Hoshower (2003) used expectancy theory to assess the validity of students' evaluation of their teachers (see also Friedman, Cox, & Maher, 2008). As Kleinbeck (1996, p. 50, own translation) points out, Vroom's approach, along with Atkinson's risk-taking model, "go a long way to clarifying the emergence of motivation, but always run into problems when it comes to explaining the relationship between motives, motivating potential, and motivation, on the one hand, and performance, on the other." How motivation is translated into action, and maintained effectively until the goal has been achieved, is the subject of volition research.

Summary

Today it is no longer possible to think about research in motivation without taking into account expectancy-value theories (cf. Feather, 1982). If for no other reason, this is because value and expectancy are the two fundamental variables producing motivation tendencies, which in turn provide us with the option to do or not do something. The family of theories has many diverse members, each of which has adjusted itself to a particular problem area. An overview of the whole clan was first provided in a volume by Feather (1982).

Some critical remarks are warranted, however. Heckhausen (1983) summarized them in five points.

However, fertile motivation models of the family of expectancy and value have been so far, they still exhibit deficiencies in a fivefold respect. The models are (1) too objectivistic in supposing that the actor would use all information on which expectancy and value variables can be based, exhaustively and without errors. Here, cognition-psychological analyses may be helpful. The models are (2) too far generalized supposing a negative correlation between expectancy and value. This appears to be the case only when the value variables belong to the type of scarce goods, which does not hold for large areas of social activities. The models are (3) too rationalistic when they suppose that expectancy and value would always fully be elaborated and integrated. At most, this holds for researchers or consulting groups devoted to a scientific decision analysis, for instance, when a site for a nuclear plant has been chosen (cf. Keeney & Raiffa, 1976). Instead of supposing an unproved rationalistic algorithm, one should uncover conditions under which, for instance, only one of the two variables is of influence. An example is task choice in preschool age children where expectancy has a developmental primacy over incentive (Heckhausen, 1984). The models are (4) inappropriately formalized when they suppose algebraic relationships at a level at which they cannot be statistically tested, because the assessed variables do not have interval scale quality. Instead, algorithms with fewer suppositions are to be employed. Finally, they are (5) too universalistic when they suppose that individual differences within conditions should only be treated as error variance, instead of using them as information as to whether various individuals obey different motivation models and why this may be so (Heckhausen, 1983, pp. 14–15).

Kuhl and Beckmann (1983) provided experimental evidence for personality differences in the use of expectancy-value algorithms. Studying behavior in a game of chance, they found that action-oriented individuals base their decisions solely on expectancy, and disregard value information, whereas state-oriented individuals make their decisions in accordance with the expectancy-value model. More recently, Stiensmeier-Pelster (1994) has shown that the situational context determines action-oriented individuals' choice of algorithm. When there is a great deal at stake, they too apply the more complex expectancy-value rule.

Review Questions

1. *What are incentives?*

Incentives are situational stimuli that alert the organism to affectively charged goal states.

2. *What are the two preconditions for people striving for goal states?*

It must be possible to anticipate the occurrence of the goal state, i.e., there must be an expectation.

The goal state must have some subjective meaning, i.e., value.

3. *What are quasi-needs?*

Quasi-needs are action goals that are derived from "real needs." They form a tension system that disappears only when the goal has been attained.

4. *What is the Zeigarnik effect?*

The Zeigarnik effect is the finding that incomplete tasks are more easily remembered than completed ones. Lewin's student Bluma Zeigarnik (1927) was the first to demonstrate the effect in an experiment designed to confirm Lewin's theory of tension systems.

5. *How did Kenneth Spence modify Hull's reinforcement theory?*

Spence extended the theory to cover incentive motivation and, in so doing, totally abandoned the Hullian reinforcement theory of habit formation.

6. *What are emotions of expectancy and what effects do they have?*

Mowrer (1960) listed four emotions of expectancy: hope, fear, disappointment, and relief. They serve to intensify the sequence of instrumental responses occurring in the run-up to the goal.

7. *What is the major difference between Atkinson's risk-taking model and the theory of resultant valence?*

In Atkinson's model, the valence function for success and failure is weighted (multiplied) by a person variable, namely, motive.

8. *Why does the risk-taking model predict maximum levels of motivation at intermediate probabilities of success?*

The values for the incentive of success and the subjective probability of success range from 0 to 1, and there is an inverse linear relationship between the two. Mathematics therefore dictates that, given a probability of success of 0.5, the incentive of success will be 0.5. Of all possible combinations of incentive and subjective probability, this one yields the highest product.

9. *How does Vroom's instrumentality theory expand on its predecessors?*

Vroom's instrumentality theory expands on previous expectancy-value theories of motivation by incorporating the consequences of action outcomes. Motivation is assumed to be influenced by the expectancy of the various consequences potentially arising from an action outcome. Specifically, the probability of the action consequences occurring, the instrumentality, is combined multiplicatively with the perceived value of these consequences.

10. *Which types of intrinsic valence do Mitchell and Albright (1972) distinguish?*

Mitchell and Albright (1972) distinguish five types of intrinsic valence:

Feelings of self-worth
 Opportunity for independent thought and action
 Opportunity for self-development
 Feelings of self-actualization
 Feelings of appropriate accomplishment

References

- Abel, T. M. (1938). Neuro-circularity reaction and the recall of unfinished and completed tasks. *Journal of Psychology*, *6*, 377–383.
- Abler, B., Walter, H., Erk, S., Kammerer, H., & Spitzer, M. (2006). Prediction error as a linear function of reward probability is coded in human nucleus accumbens. *NeuroImage*, *31*, 790–795.
- Ach, N. (1910). *Über den Willensakt und das Temperament*. Leipzig, Germany: Quelle & Meyer.
- Adler, D. L., & Kounin, J. S. (1939). Some factors operating at the moment of resumption of interrupted tasks. *Journal of Psychology*, *7*, 255–267.
- Ajzen, I., & Fishbein, M. (1969). The prediction of behavioral intentions in a choice situation. *Journal of Experimental Social Psychology*, *5*, 400–416.
- Alper, T. G. (1946). Task-orientation vs. ego-orientation in learning and retention. *American Journal of Psychology*, *59*, 236–248.
- Alper, T. G. (1957). Predicting the direction of selective recall: Its relation to ego strength and n achievement. *Journal of Abnormal and Social Psychology*, *55*, 149–165.
- Atkinson, J. W. (1953). The achievement motive and recall of interrupted and completed tasks. *Journal of Experimental Psychology*, *46*, 381–390.
- Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, *64*, 359–372.
- Atkinson, J. W. (1964). *An introduction to motivation*. Princeton, NJ: Van Nostrand.
- Atkinson, J. W., & Feather, N. T. (Eds.). (1966). *A theory of achievement motivation*. New York: Wiley.
- Bandura, A. (1971). Vicarious and self-reinforcement processes. In R. Glaser (Ed.), *The nature of reinforcement* (pp. 228–278). New York: Academic.
- Barker, R. G., & Gump, P. (Eds.). (1964). *Big school, small school: High school size and student behavior*. Stanford, CA: Stanford University Press.
- Beck, F., & Beckmann, J. (2010). Die Bedeutung striataler Plastizitätsvorgänge und unerwarteten

- Bewegungserfolgs für sportmotorisches Lernen. *Sportwissenschaft*, 40, 19–25.
- Beckmann, J. (1996). Self-presentation and the Zeigarnik effect. In J. Beckmann (Ed.), *Advances in motivation* (pp. 35–45). Oslo, Norway: Scandinavian University Press.
- Beckmann, J., Bobka, K., Fehrenbach, H., Hellebrandt, M., Rost, K. (2004). *The perseverance of complete and incomplete intentions in memory. Zeigarnik effect or self-serving recall*. Manuskript, Universität Potsdam.
- Berridge, K. C., & Robinson, T. E. (1998). What is the role of dopamine in reward: Hedonic impact, reward learning, or incentive salience? *Brain Research Reviews*, 28, 309–369.
- Bernoulli, D. (1738). Specimen theoriae novae de mensura sortis. *Commentarii Academiae Scientiarum Imperialis Petropolitanae*, 5, 175–192.
- Bindra, D. (1969). The interrelated mechanisms of reinforcement and motivation, and the nature of their response. In W. J. Arnold & D. Levine (Eds.), *Nebraska symposium on motivation* (pp. 1–38). Lincoln, NE: University of Nebraska Press.
- Bindra, D. (1974). A motivational view of learning, performance, and behavior modification. *Psychological Review*, 81, 199–213.
- Blodgett, H. C. (1929). The effect of the introduction of reward upon the maze performance of rats. *University of California Publications in Psychology*, 4, 113–134.
- Bolles, R. C. (1967). *Theory of motivation*. New York: Harper & Row.
- Bolles, R. C. (1972). Reinforcement, expectancy, and learning. *Psychological Review*, 79, 394–409.
- Bouton, M. E., & Fanselow, M. S. (1997). *Learning, motivation and cognition*. Washington, DC: American Psychological Association.
- Breland, K., & Breland, M. (1961). The misbehavior of animals. *American Psychologist*, 16, 681–684.
- Brown, J. F. (1933). Über die dynamischen Eigenschaften der Realitäts- und Irrealitätsschichten. *Psychologische Forschung*, 18, 1–26.
- Brown, P. L., & Jenkins, H. M. (1968). Auto-shaping of the pigeon's key-peck. *Journal of Analysis of Behavior*, 11, 1–8.
- Butterfield, E. C. (1964). The interruption of tasks: Methodological, factual and theoretical issues. *Psychological Bulletin*, 62, 309–322.
- Butz, M. V., & Hoffmann, J. (2002). Anticipations control behavior: Animal behavior in an anticipatory learning classifier system. *Adaptive Behavior*, 10, 75–96.
- Campbell, J. P., Dunnette, M. D., Lawler, E. E., & Weick, K. E. (1970). *Managerial behavior performance and effectiveness*. New York: McGraw Hill.
- Carlson, E. R. (1956). Attitude change through modification of attitude structure. *Journal of Abnormal and Social Psychology*, 52, 256–261.
- Caron, A. J., & Wallach, M. A. (1957). Recall of interrupted tasks under stress: A phenomenon of memory or learning? *Journal of Abnormal and Social Psychology*, 55, 372–381.
- Caron, A. J., & Wallach, M. A. (1959). Personality determinants of repressive and obsessive reactions to failure stress. *Journal of Abnormal and Social Psychology*, 59, 236–245.
- Cartwright, D. (1942). The effect of interruption, completion and failure upon the attractiveness of activity. *Journal of Experimental Psychology*, 31, 1–16.
- Cartwright, D., & Festinger, L. (1943). A quantitative theory of decision. *Psychological Review*, 50, 595–621.
- Chen, Y., & Hoshower, L. B. (2003). Student evaluation of teaching effectiveness: An assessment of student perception and motivation. *Assessment and Evaluation in Higher Education*, 28, 71–88.
- Coopersmith, S. (1960). Self-esteem and need achievement as determinants of selective recall and repetition. *Journal of Abnormal and Social Psychology*, 60, 310–317.
- Crespi, L. P. (1942). Quantitative variation of incentive and performance in the white rat. *American Journal of Psychology*, 55, 467–517.
- Crespi, L. P. (1944). Amount of reinforcement and level of performance. *Psychological Review*, 51, 341–357.
- Dembo, T. (1931). Der Ärger als dynamisches Problem. *Psychologische Forschung*, 15, 1–44.
- Dickinson, A. (1997). Bolles's psychological syllogism. In M. E. Bouton & M. S. Fanselow (Eds.), *Learning, motivation and cognition* (pp. 345–367). Washington, DC: American Psychological Association.
- Edwards, W. (1954). The theory of decision-making. *Psychological Bulletin*, 51, 380–417.
- Edwards, W. (1962). Utility, subjective probability, their interaction, and variance preferences. *Journal of Conflict Resolution*, 6, 42–51.
- Elliott, M. H. (1928). The effect of change of reward on the maze performance of rats. *University of California Publications in Psychology*, 4, 19–30.
- Escalona, S. K. (1940). The effect of success and failure upon the level of aspiration and behavior in manic-depressive psychoses. *University of Iowa, Studies in Child Welfare*, 16, 199–302.
- Fajans, S. (1933). Die Bedeutung der Entfernung für die Stärke eines Aufforderungscharakters beim Säugling und Kleinkind. *Psychologische Forschung*, 17, 215–267.
- Feather, N. T. (1959a). Subjective probability and decision under uncertainty. *Psychological Review*, 66, 150–164.
- Feather, N. T. (1959b). Success probability and choice behavior. *Journal of Experimental Psychology*, 58, 257–266.
- Feather, N. T. (Ed.). (1982). *Expectations and actions: Expectancy-value-models in psychology*. Hillsdale, NJ: Erlbaum.
- Ferguson, E. D. (1962). Ego involvement: A critical examination of some methodological issues. *Journal of Abnormal and Social Psychology*, 64, 407–417.

- Festinger, L. (1942). A theoretical interpretation of shifts in level of aspiration. *Psychological Review*, 49, 235–250.
- Forrest, D. W. (1959). The role of muscular tension in the recall of interrupted tasks. *Journal of Experimental Psychology*, 58, 181–184.
- Frank, J. D. (1935). Individual differences in certain aspects of level of aspiration. *American Journal of Psychology*, 47, 119–128.
- Freeman, G. L. (1930). Changes in tonus during completed and interrupted mental work. *Journal of Genetic Psychology*, 4, 309–334.
- Freud, S. (1901). *Zur Psychopathologie des Alltagslebens*. (GW, Bd. IV, 1952). Frankfurt, Germany: Fischer.
- Freud, S. (1952). *Trieb- und Triebchicksale*. (GW, Bd. X, 1915). Frankfurt, Germany: Fischer.
- Friedman, B. A., Cox, P. L., & Maher, L. E. (2008). An expectancy theory approach to peer assessment. *Journal of Management Education*, 32, 580–612.
- Fuchs, R. (1954). *Gewißheit, Motivation und bedingter Reflex*. Meisenheim, Germany: Hain.
- Galbraith, J., & Cummings, L. (1967). An empiric investigation of the motivational determinants of past performance: Interactive effects between instrumentality-valence, motivation, and ability. *Organizational Behavior and Human Performance*, 2, 237–257.
- Gebhard, M. (1948). Effects of success and failure upon the attractiveness of activities as a function of experience, expectation, and need. *Journal of Experimental Psychology*, 38, 371–388.
- Georgopolous, B. S., Mahoney, G. M., & Jones, N. W. (1957). A path-goal approach to productivity. *Journal of Applied Psychology*, 41, 345–353.
- Glixman, A. F. (1948). An analysis of the use of the interruption-technique in experimental studies of repression. *Psychological Bulletin*, 45, 491–506.
- Goodman, P. S., Rose, J. H., & Furcon, J. E. (1970). Comparison of motivational antecedents of the work performance of scientists and engineers. *Journal of Applied Psychology*, 54, 491–495.
- Graen, G. (1969). Instrumentality theory of work motivation: Some experimental results and suggested modifications. *Journal of Applied Psychology Monographs*, 53, 1–25.
- Gavin, J. F. (1970). Ability, effort, and role perception as antecedents of job performance. Experimental Publication System (Manuscript no. 190A), 5.
- Green, D. (1963). Volunteering and the recall of interrupted tasks. *Journal of Abnormal and Social Psychology*, 66, 397–401.
- Greenwald, A. G. (1982). Ego task analysis: An integration of research on ego-involvement and self-awareness. In A. Hastorf & A. Isen (Eds.), *Cognitive social psychology* (pp. 109–147). New York: Elsevier.
- Hackman, J. R., & Porter, L. W. (1968). Expectancy theory predictions of work effectiveness. *Organizational Behavior and Human Performance*, 3, 417–426.
- Halisch, F., & Heckhausen, H. (1988). Motive-dependent vs. ability-dependent valence functions for success and failure. In F. Halisch & J. van den Bercken (Eds.), *Intentional perspectives on achievement and task motivation*. Lisse, The Netherlands: Swets & Zeitlinger.
- Heckhausen, H. (1955). Motivationsanalyse der Anspruchsniveau-Setzung. *Psychologische Forschung*, 25, 118–154.
- Heckhausen, H. (1963a). *Hoffnung und Furcht in der Leistungsmotivation*. Meisenheim, Germany: Hain.
- Heckhausen, H. (1963b). Eine Rahmentheorie der Motivation in zehn Thesen. *Zeitschrift für Experimentelle und Angewandte Psychologie*, 10, 604–626.
- Heckhausen, H. (1965). Leistungsmotivation. In H. Thomae (Ed.), *Handbuch der Psychologie* (Vol. II, pp. 602–702). Göttingen, Germany: Hogrefe.
- Heckhausen, H. (1969). *Allgemeine Psychologie in Experimenten*. Göttingen, Germany: Hogrefe.
- Heckhausen, H. (1980). *Motivation und Handeln*. Berlin, Germany: Springer.
- Heckhausen, H. (1983). Motivationsmodelle: Fortschreitende Entfaltung und unbehobene Mängel. In W. Hacker, W. Volpert, & M. V. Cranach (Eds.), *Kognitive und motivationale Aspekte der Handlung* (pp. 9–17). Berlin, Germany: VEB Deutscher Verlag der Wissenschaften.
- Heckhausen, H. (1984). Emergent achievement behavior: Some early developments. In J. Nicholls (Ed.), *Advances in achievement motivation* (pp. 1–32). Greenwich, CT: JAI Press.
- Heckhausen, H., Schmalt, H.-D., & Schneider, K. (1985). *Achievement motivation in perspective*. New York: Academic.
- Heider, F. (1960). The Gestalt theory of motivation. In M. R. Jones (Ed.), *Nebraska symposium on motivation* (pp. 145–172). Lincoln, NE: University of Nebraska Press.
- Henemann, H. H., & Schwab, D. P. (1972). Evaluation of research on expectancy theory of employee performance. *Psychological Bulletin*, 78, 1–9.
- Henle, M. (1944). The influence of valence on substitution. *Journal of Psychology*, 17, 11–19.
- Hillgruber, A. (1912). Fortlaufende Arbeit und Willensbetätigung. *Untersuchungen zur Psychologie und Philosophie*, 1, 6.
- Hoffmann, J. (1993). *Vorhersage und Erkenntnis: Die Funktion von Antizipationen in der menschlichen Verhaltenssteuerung und Wahrnehmung*. Göttingen, Germany: Hogrefe.
- Hoppe, F. (1930). Untersuchungen zur Handlungs- und Affektpsychologie. IX. Erfolg und Mißerfolg. *Psychologische Forschung*, 14, 1–63.
- Hull, C. L. (1943). *Principles of behavior*. New York: Appleton-Century-Crofts.
- Irwin, F. W. (1953). Stated expectations as functions of probability and desirability of outcomes. *Journal of Personality*, 21, 329–339.
- Isaac, R. Z., Wilfred, J. P., & Douglas, C. (2001). Leadership and motivation: The effective application

- of expectancy theory. *Journal of Managerial Issues*, 13, 3045–3695.
- Jucknat, M. (1938). Leistung, Anspruchsniveau und Selbstbewußtsein. *Psychologische Forschung*, 22, 89–179.
- Junker, E. (1960). *Über unterschiedliches Behalten eigener Leistungen*. Frankfurt, Germany: Kramer.
- Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist*, 39, 341–350.
- Kanfer, R. (1990). Motivation theory and industrial and organizational psychology. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (pp. 75–170). Palo Alto, CA: Consulting Psychology Press.
- Karabenick, J. D., & Heller, K. A. (1976). A developmental study of effort and ability attributions. *Developmental Psychology*, 12, 559–560.
- Keeney, R. C., & Reiffa, H. (1976). *Decision with multiples objectives: Preferences and value tradeoffs*. New York: Wiley.
- Klandermans, P. G. (1983). Rotter's I-E-scale and socio-political action-taking: The balance of 20 years of research. *European Journal of Social Psychology*, 13, 399–415.
- Kleinbeck, U. (1996). *Arbeitsmotivation. Entstehung, Wirkung und Förderung*. Weinheim, BW: Juventa.
- Kuhl, J. (2001). *Motivation und Persönlichkeit. Die Interaktion psychischer Systeme*. Göttingen, Germany: Hogrefe.
- Kuhl, J., & Beckmann, J. (1983). Handlungskontrolle und Umfang der Informationsverarbeitung: Wahl einer einfachen (nicht optimalen) Entscheidungsregel zugunsten rascher Handlungsbereitschaft. *Zeitschrift für Sozialpsychologie*, 14, 241–250.
- Kukla, A. (1972). Attributional determinants of achievement-related behavior. *Journal of Personality and Social Psychology*, 21, 166–174.
- Kunde, W., Koch, I., & Hoffmann, J. (2004). Anticipated action effects affect the selection, initiation and execution of actions. *Quarterly Journal of Experimental Psychology. Section A: Human Experimental Psychology*, 57(A), 87–106.
- Lawler, E. E. (1968). A correlational-causal analyse of the relationship between expectancy attitudes and job performance. *Journal of Applied Psychology*, 52, 462–468.
- Lawler, E. E., & Porter, L. W. (1967). Antecedent attitudes of effective managerial job performance. *Organizational Behavior and Human Performance*, 2, 122–142.
- Lefcourt, H. M. (1976). *Locus of control: Current trends in theory and research*. New York: Wiley.
- Lewin, K. (1922). Das Problem der Willensmessung und das Grundgesetz der Assoziation II. *Psychologische Forschung*, 2, 65–140.
- Lewin, K. (1926a). Untersuchungen zur Handlungs- und Affekt-Psychologie, I: Vorbemerkungen über die psychischen Kräfte und Energien und über die Struktur der Seele. *Psychologische Forschung*, 7, 294–329.
- Lewin, K. (1926b). Untersuchungen zur Handlungs- und Affekt-Psychologie, II.: Vorsatz, Wille und Bedürfnis. *Psychologische Forschung*, 7, 330–385.
- Lewin, K. (1931a). *Die psychologische Situation bei Lohn und Strafe*. Leipzig, Germany: Hirzel.
- Lewin, K. (1931b). Environmental forces in child behavior and development. In C. Murchison (Ed.), *Handbook of childpsychology* (pp. 94–127). Worcester, MA: Clark University Press.
- Lewin, K. (1932). *Ersatzhandlung und Ersatzbefriedigung. Bericht über den 12. Kongreß der Deutschen Gesellschaft für Psychologie, Hamburg, 1931*. Jena, Germany: Fischer.
- Lewin, K. (1934). Der Richtungs-begriff in der Psychologie: Der spezielle und allgemeine hodologische Raum. *Psychologische Forschung*, 19, 249–299.
- Lewin, K. (1935). *A dynamic theory of personality: Selected papers*. New York: McGraw-Hill.
- Lewin, K. (1936). *Principles of topological psychology*. New York: McGraw-Hill.
- Lewin, K. (1938). *The conceptual representation and the measurement of psychological forces*. Durham, NC: Duke University Press.
- Lewin, K. (1939). Field theory and experiment in social psychology. *American Journal of Sociology*, 44, 868–897.
- Lewin, K. (1942). Field theory of learning. *Yearbook of National Social Studies of Education*, 41, 215–242.
- Lewin, K. (1943). Defining the field at a given time. *Psychological Review*, 50, 292–310.
- Lewin, K. (1946a). Action research and minority problems. *Journal of Social Issues*, 2, 34–46.
- Lewin, K. (1946b). Behavior and development as a function of the total situation. In L. Carmichael (Ed.), *Manual of child psychology* (pp. 791–844). New York: Wiley.
- Lewin, K. (1947). Group decision and social change. In E. E. Maccoby, T. M. Newcomb, & E. L. Hartley (Eds.), *Readings in social psychology* (pp. 197–211). New York: Holt, Rinehart & Winston.
- Lewin, K. (1951). *Field theory in social science*. Chicago: University of Chicago Press.
- Lewin, K., Dembo, T., Festinger, L., & Sears, P. S. (1944). Level of aspiration. In J. McHunt (Ed.), *Personality and the behavior disorders* (Vol. 1, pp. 333–378). New York: Ronald.
- Lippitt, R. (1940). An experimental study of the effect of democratic and authoritarian group atmospheres. *University of Iowa Studies in Child Welfare*, 16, 45–195.
- Lissner, K. (1933). Die Entspannung von Bedürfnissen durch Ersatzhandlungen. *Psychologische Forschung*, 18, 218–250.
- Locke, E. A. (1968). Toward a theory of task motivation and incentives. *Organizational Behavior and Human Performance*, 3, 157–189.
- Mahler, W. (1933). Ersatzhandlungen verschiedenen Realitätsgrades. *Psychologische Forschung*, 18, 27–89.
- Marrow, A. J. (1938). Goal tensions and recall. *Journal of General Psychology*, 19, 3–35.

- Martin, L. L., & Tesser, A. (1989). Toward a motivational and structural theory or ruminative thought. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 306–326). New York: Guilford.
- McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953). *The achievement motive*. New York: Appleton-Century-Crofts.
- Meyer, W.-U. (1973). Anstrengungsintention in Abhängigkeit von Begabungseinschätzung und Aufgabenschwierigkeit. *Archiv für Psychologie*, *125*, 245–262.
- Milburn, M. A. (1978). Sources of bias in the prediction of future events. *Organizational Behavior and Human Performance*, *21*, 17–26.
- Milner, P. (1970). *Physiological psychology*. New York: Holt, Rinehart & Winston.
- Mitchell, T. R. (1974). Expectancy models of job satisfaction, occupational preference and effort: A theoretical, methodological, and empirical appraisal. *Psychological Bulletin*, *81*, 1053–1077.
- Mitchell, T. R. (1982). Expectancy-value models in organizational psychology. In N. T. Feather (Ed.), *Expectations and actions: Expectancy-value models in psychology* (pp. 293–312). Hillsdale, NJ: Erlbaum.
- Mitchell, T. R., & Albright, D. (1972). Expectancy theory predictions of job satisfaction, job effort, job performance, and retention of naval aviation officers. *Organizational Behavior and Human Performance*, *8*, 1–20.
- Mitchell, T. R., & Biglan, A. (1971). Instrumentality theories: Current uses in psychology. *Psychological Bulletin*, *76*, 432–454.
- Mittag, H.-D. (1955). Über personale Bedingungen des Gedächtnisses für Handlungen. *Zeitschrift für Psychologie*, *158*, 40–120.
- Morgan, C. T. (1943). *Physiological psychology*. New York: McGraw-Hill.
- Moulton, R. W. (1958). Notes for a projective measure for fear of failure. In J. W. Atkinson (Ed.), *Motives in fantasy, action, and society* (pp. 563–571). Princeton, NJ: Van Nostrand.
- Mowrer, H. O. (1960). *Learning theory and behavior*. New York: Wiley.
- Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton, NJ: Princeton University Press.
- Ovsiankina, M. (1928). Die Wiederaufnahme unterbrochener Handlungen. *Psychologische Forschung*, *11*, 302–379.
- Peak, H. (1955). Attitude and motivation. In M. R. Jones (Ed.), *Nebraska symposium on motivation* (pp. 149–189). Lincoln: University of Nebraska Press.
- Pfaffmann, C. (1982). Taste. A model of incentive motivation. In D. W. Pfaff (Ed.), *The physiological mechanisms of motivation* (pp. 61–97). Berlin, Germany: Springer.
- Phares, E. J. (1976). *Locus of control in personality*. Morristown, NJ: General Learning.
- Porter, L. W., & Lawler, E. E. (1968). *Managerial attitudes and performance*. Homewood, CA: Irwin-Dorsey.
- Postman, L., & Solomon, R. L. (1949). Perceptual sensitivity to completed and incompleting tasks. *Journal of Personality*, *18*, 347–357.
- Pritchard, R. D., & Sanders, M. S. (1973). The influence of valence, instrumentality, and expectancy of effort and performance. *Journal of Applied Psychology*, *57*, 55–60.
- Reynolds, W. F., & Anderson, J. E. (1961). Choice behavior in a T-maze as a function of deprivation period and magnitude or reward. *Psychological Reports*, *8*, 131–134.
- Rosenberg, G. J. (1956). Cognitive structure and attitudinal affect. *Journal of Abnormal and Social Psychology*, *53*, 367–372.
- Rosenzweig, S. (1933). Preferences in the repetition of successful and unsuccessful activities as a function of age and personality. *Journal of Genetic Psychology*, *42*, 423–441.
- Rosenzweig, S. (1941). Need-persistent and ego-defensive reactions to frustration as demonstrated by an experiment on repression. *Psychological Review*, *48*, 347–349.
- Rosenzweig, S. (1943). Experimental study of repression with special reference to need-persistent and ego-defensive reactions to frustration. *Journal of Experimental Psychology*, *32*, 64–74.
- Rosenzweig, S. (1945). Further comparative data on repetition choice after success and failure as related to frustration tolerance. *Journal of Genetic Psychology*, *66*, 75–81.
- Rösler, H.-D. (1955). Über das Behalten von Handlungen schwachsinniger und normaler Kinder [Retention of actions by feeble-minded and normal children]. *Zeitschrift für Psychologie*, *158*, 161–231.
- Rotter, J. B. (1954). *Social learning and clinical psychology*. Englewood Cliffs, NJ: Prentice-Hall.
- Rotter, J. B. (1955). The role of the psychological situation in determining the direction of human behavior. In M. R. Jones (Ed.), *Nebraska symposium on motivation* (pp. 245–269). Lincoln, NE: Nebraska University Press.
- Rotter, J. B. (1960). Some implications of a social learning theory for the prediction of goal directed behavior from testing procedures. *Psychological Review*, *67*, 301–316.
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*. (whole No. 609), *80*, 1–28.
- Rotter, J. B., Chance, J. E., & Phares, E. J. (1972). *Applications of a social learning theory of personality*. New York: Holt, Rinehart & Winston.
- Rotter, J. B., Liverant, S., & Crowne, D. P. (1961). The growth and extinction of expectancies in chance controlled and skilled tasks. *Journal of Psychology*, *52*, 161–177.
- Rotter, J. B., Seeman, M. R., & Liverant, S. (1962). Internal versus external control of reinforcements: A major variable in behavior theory. In W. F. Washburn (Ed.), *Decisions, values, and groups* (Vol. 2, pp. 473–516). New York: Pergamon.

- Rotter, J. B. (1982). Social learning theory. In N. T. Feather (Ed.), *Expectations and actions* (pp. 241–260). Hillsdale, NJ: Erlbaum.
- Sanford, R. N., & Risser, J. (1948). What are the conditions of self-defensive forgetting? *Journal of Personality*, *17*, 244–260.
- Schmalt, H.-D. (1996). Zur Kohärenz von Motivation und Kognition. In J. Kuhl & H. Heckhausen (Eds.), *Enzyklopädie der Psychologie. Motivation, Volition und Handeln* (pp. 241–273). Göttingen, Germany: Hogrefe.
- Schmidt, F. L. (1973). Implications of a measurement problem for expectancy theory research. *Organizational Behavior and Human Performance*, *10*, 243–251.
- Schneider, K. (1973). *Motivation unter Erfolgsrisiko*. Göttingen, Germany: Hogrefe.
- Schneider, K., & Schmalt, H.-D. (1994). *Motivation* (2nd ed.). Stuttgart, Germany: Kohlhammer.
- Schultz, W. (2002). Getting formal with dopamine and reward. *Neuron*, *36*, 241–263.
- Sears, R. R. (1950). Personality. *Annual Review of Psychology*, *1*, 105–118.
- Semmer, N. (1995). Die Komplexität der Motivation. *Psychoscope*, *16*(19), 11–15.
- Seward, J. P. (1942). Note on the externalization of drive. *Psychological Review*, *49*, 197–199.
- Seward, J. P. (1951). Experimental evidence for the motivating function of reward. *Psychological Bulletin*, *48*, 130–149.
- Sheffield, F. D., Roby, T. B., & Campbell, B. A. (1954). Drive reduction versus consummatory behavior as determinants of reinforcement. *Journal of Comparative and Physiological Psychology*, *47*, 349–355.
- Simmons, R. (1924). *The relative effectiveness of certain incentives in animal learning*. Comparative Psychology Monographs, 2, serial Nr. 7.
- Smith, A. A. (1953). An electromyographic study of tension in interrupted and completed tasks. *Journal of Experimental Psychology*, *46*, 32–36.
- Smock, C. D. (1957). Recall of interrupted and non-interrupted tasks as a function of experimentally induced anxiety and motivational relevance of the task stimuli. *Journal of Personality*, *25*, 589–599.
- Spence, K. W. (1956). *Behavior theory and conditioning*. New Haven, CT: Yale University Press.
- Stiensmeier-Pelster, J. (1994). Choice of decision-making strategies and action versus state orientation. In J. Kuhl & J. Beckmann (Eds.), *Volition and personality, action versus state orientation* (pp. 167–176). Göttingen, Germany: Hogrefe.
- Taub, E., & Berman, A. J. (1968). Movement and learning in the absence of sensory feedback. In S. J. Freedman (Ed.), *The neuropsychology of spatially oriented behavior* (pp. 173–192). Homewood, CA: Dorsey.
- Toates, T. M. (1986). *Motivational systems*. Cambridge, UK: Cambridge University Press.
- Tolman, E. C. (1926). The nature of fundamental drives. *Journal of Abnormal and Social Psychology*, *20*, 349–358.
- Tolman, E. C. (1932). *Purposive behaviour in animals and men*. New York: Appleton-Century.
- Tolman, E. C. (1951). A psychological model. In T. Parsons & E. Shils (Eds.), *Toward a general theory of action* (pp. 279–361). Cambridge, MA: Harvard University Press.
- Tolman, E. C. (1952). A cognitive motivation model. *Psychological Review*, *59*, 389–400.
- Tolman, E. C. (1959). Principles of purposive behavior. In S. Koch (Ed.), *Psychology: A study of a science* (Vol. II, pp. 92–157). New York: McGraw-Hill.
- Tolman, E. C., & Honzik, C. A. (1930). Degree of hunger, reward and nonreward, and maze learning in rats. *University of California Publications in Psychology*, *4*, 241–256.
- Vroom, V. H. (1964). *Work and motivation*. New York: Wiley.
- Wahba, M. A., & House, R. J. (1974). Expectancy theory in work and motivation: Some logical and methodological issues. *Human Relations*, *27*, 121–147.
- Walker, E. L. (1969). Reinforcement – the one ring. In J. T. Trapp (Ed.), *Reinforcement and behavior* (pp. 47–62). New York: Academic.
- Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, *98*, 219–235.
- Weiner, B. (1965). Need achievement and the resumption of incompleting tasks. *Journal of Personality and Social Psychology*, *1*, 165–168.
- Wicklund, R. A., & Gollwitzer, P. M. (1982). *Symbolic self-completion*. Hillsdale, NJ: Erlbaum.
- Williams, D. R., & Williams, H. (1969). Auto-maintenance in the pigeon: Sustained pecking despite contingent non-reinforcement. *Journal of the Experimental Analysis of Behavior*, *12*, 511–520.
- Wise, R. A., & Rompré, P.-P. (1989). Brain dopamine and reward. *Annual Review of Psychology*, *40*, 191–225.
- Worchel, P. (1957). Adaptability screening of flying personnel: Development of a self-concept inventory for predicting maladjustment. *USAF School of Aviation Medicine Report*, 56–62.
- Zeaman, D. (1949). Response latency as a function of the amount of reinforcement. *Journal of Experimental Psychology*, *39*, 466–483.
- Zeigarnik, B. (1927). Über das Behalten von erledigten und unerledigten Handlungen. *Psychologische Forschung*, *9*, 1–85.