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THE INTENSITY OF MOTIVATION

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CONTENTS

INTRODUCTION

The idea that motivational arousal should increase with difficulty was suggested by Ach (discussed in Kuhl & Beckmann 1985), who focused on the will to overcome task distractions, and by Hillgruber (discussed by e.g. Heckhausen et al 1985), who noted that motivation must increase to match required effort. More recently, Kukla (1972) hypothesized that the intention to try is a function of a cost-benefit analysis, and, with benefits (e.g. outcomes) held constant, would be an increasing function of task difficulty up to the point at which the individual decides the potential outcome is not worth the effort. In a somewhat different arena, Kahneman (1973) offered the hypothesis that attentional effort rises as a direct function of attentional demand, but increasingly falls short; and more recently, Eysenck (1982) has explored the effects of motivation on attention. These previous formulations

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offer only a partial explanation for the bulk of data now available. At the same time, current investigators, with a few exceptions, have failed to note the significance of the difficulty of instrumental behavior in the understanding of motivated behavior. For example, in their otherwise excellent review of the literature on social motivation, Pittman & Heller (1987) distinguished between the states of "control" and "no control." In the following pages we hope to show, among other things, why an understanding of the psychological effects of control must take note of the difficulty of exerting control.

POTENTIAL MOTIVATION AND MOTIVATIONAL AROUSAL

Intensity of motivation may be thought of as the momentary magnitude of motivational arousal. Where the magnitude of motivational arousal concerns the total amount of effort a person would make to satisfy a motive, and this effort could be spread over time, the intensity is the magnitude at a point in time. Thus, where a high level of motivational arousal is spread over a long period, the intensity of motivation could always be low. However, where the magnitude of motivational arousal is high and must be concentrated within a brief period, the intensity of motivation must be great. It is the difference, for example, between moving 100 pounds of books one book at a time or all at once.

Potential Motivation

While the factors that determine the magnitude of motivation, or the total effort one is willing to make, are not the central concern of this review, they nevertheless must be understood because they set a boundary on the intensity of motivation. Here we adopt the simple position that whatever factors affect the effort one is willing to make to satisfy a motive are in fact the determinants of the magnitude of motivation. In general, these factors are internal states such as needs (e.g. food deprivation), potential outcomes (e.g. acquisition of food, experience of pain), and the perceived probability that some behavior, if successfully executed, will satisfy the need, produce or avoid the outcome. As in typical expectancy-value models of motivation, we assume that needs and/or potential outcomes vary in magnitude or value, and that the magnitude of motivation is a multiplicative function of need, value of the potential outcome, and the perceived probability that a properly executed behavior will produce the desired effect. This model, which will be recognized as a simple version of many present-day theories of motivation, depicts what we call *potential motivation*. The reason it is called potential as opposed to actual motivation is that it is not a sufficient set of conditions for the specification of motivational arousal.

Motivational Arousal

The direct function of motivational arousal is not the satisfaction of needs or the avoidance or acquisition of potential outcomes. Rather, it is the production of instrumental behavior. The effort required for that instrumental behavior is not simply proportional to needs and/or outcome values. If we assume that the organism conserves energy, then motivational arousal, or the mobilization of energy, should be no greater than is necessary to produce the needed instrumental behavior. Thus, when little effort is needed, motivational arousal should be low no matter how great the need or how valuable the potential outcome.

There is an upper limit, of course, on what one can or will do. As long as one is able to perform the required instrumental behavior, the upper limit is determined by whether or not potential motivation justifies the amount of effort required. A person who has just had dinner will do little to obtain a hamburger, while a person who has gone without food for a day may be willing to do quite a lot. In other cases, the required instrumental behavior may call for abilities or skills beyond the individual's capacities, in which case there should be no energization regardless of the level of potential motivation. No matter how worthwhile it might be for people to jump 20 feet in the air, they do not energize to carry out that action.

In summary, potential motivation is created by needs and/or potential outcomes and the expectation that performance of a behavior will affect those needs and outcomes. Motivational arousal occurs, however, only to the extent that the required instrumental behavior is difficult, within one's capacity, and is justified by the magnitude of potential motivation. When the difficulty of instrumental behavior surpasses one's capacities or outweighs the value of the potential gain (need reduction, outcome attainment, or outcome avoidance), there will be little or no mobilization of energy. The greater the potential motivation, the greater is the amount of energy that a person will be willing to mobilize. For further discussion of theoretical issues, see Wright & Brehm (1988).

EVIDENCE ON THE JOINT EFFECTS OF POTENTIAL MOTIVATION AND DIFFICULTY

There are three arenas of evidence for the joint effects of potential motivation and the difficulty of instrumental behavior. They are (*a*) physiological data on arousal, (*b*) behavioral effects, and (*c*) subjective appraisals of motivational factors.

Effects on Cardiovascular Reactivity

Because the function of motivational arousal is the production of instrumental behavior, measures of arousal deemed most reflective of motivation involve the sympathetic nervous system, which prepares the organism for activity. Specifically, cardiovascular changes in response to beta-adrenergic stimulation have been linked with effortful coping (Obrist et al 1978). Laboratory attempts to document the relationship between task difficulty and motivational arousal have focused on cardiovascular reactivity as measured by changes in heart rate (HR) and systolic and diastolic blood pressure (SBP and DBP). These changes have been noted not only during coping behavior, but also immediately prior to instrumental activity, indicating that motivational arousal varies in anticipation of task demand.

ANTICIPATORY AROUSAL A recent study by Wright et al (1988a) varied the difficulty of a memory task required to prevent exposure to an aversive noise. In the easy condition, subjects were told they must memorize two nonsense trigrams within two minutes in order to avoid the noise, while in the difficult condition, subjects were told they must memorize seven trigrams. Subjects in a third condition were told they had been assigned to hear the noise, and no instrumental avoidance behavior was provided.

Immediately after subjects indicated they were ready to begin the memorization (or, in the third condition, to hear the noise), HR and blood pressure readings were taken. These measures were intended to provide evidence of variations in anticipatory motivational arousal.

Both HR- and SBP-change scores varied nonmonotonically with the difficulty of the avoidance task. Heart rate reactivity was greater when subjects expected to memorize seven trigrams than when they expected two or when there was nothing they could do to avoid the noise. Changes in SBP followed the same pattern.

However, DBP-change scores decreased linearly as the difficulty of avoidance increased. Diastolic blood pressure had been described in previous research as mediated by interactions between the inhibitory and excitatory aspects of vascular stimulation (Obrist 1981); therefore, these results were not unexpected.

The effects of task difficulty on HR and SBP in the above study thus provide evidence that anticipatory motivational arousal is a function of energy mobilization in accordance with what is needed for instrumental behavior to avoid an aversive outcome. Two studies indicate that the relationship also holds in an appetitive context.

The first of these (Contrada et al 1984) offered subjects $3.00 for mentally solving eight out of ten arithmetic problems within five minutes, ostensibly as part of a national test standardization procedure. The difficulty of this task was varied by presenting different groups of subjects with problems that were labeled either "high school freshman level" or "second year college level," and that indeed were simple or difficult for the average undergraduate to solve. Measures of blood pressure were taken immediately before the five-minute period was to start, revealing greater SBP increases in the difficult condition than in the easy condition.

The second study (Wright et al 1986) changed the cognitive task and added an impossible condition. Subjects in this study were promised their choice of several pens in a display case if they correctly memorized either 2, 6, or 20 nonsense trigrams within two minutes. Those in the 20-trigram condition were told that this was impossible for most people. Manipulation checks revealed that subjects in this condition reported, on an 11-point scale from 0 to 10, a mean likelihood of success of 0.86.

Measures of HR, SBP, and DBP were taken immediately before subjects expected to begin the memorization. Change scores for SBP showed the predicted effect of task difficulty, with the greatest increase in the difficult (6-trigram) condition. However, HR and DBP were unaffected.

Wright (1984) examined cardiovascular reactivity in preparation for a motor task to avoid shock. In this study, reactivity was assessed by measuring pulse rate and finger pulse volume (greater volume indicating lower reactivity). Some subjects were told they could avoid assignment to a punishment learning session, where they would be shocked for incorrect answers, by first successfully performing a qualifying task. For some subjects the task involved a difficult squeeze on a dynamometer, while for other subjects the task was an easy flip of a toggle switch. Subjects in an impossible-avoidance condition were told that they had been assigned to the punishment group and would receive shocks.

In addition, within the easy and difficult task conditions, subjects were given treatments designed to produce variations in their certainty concerning what response should be made. These manipulations were intended to distinguish between two theoretical types of difficulty in exerting control over outcomes: (*a*) control difficulty due to effortfulness of instrumental behavior, and (*b*) control difficulty due to uncertainty about what behavior should be performed. The former difficulty was varied by assigning subjects to the toggle switch or dynamometer grip tasks. The latter difficulty was varied within these tasks by presenting subjects with a choice between two toggle switches or two dynamometers, and telling them that they could distinguish the correct one to use by performing a color discrimination task. This involved detecting the darker of two squares associated with the two instruments. For some subjects one square was made clearly darker; they could see they would easily know which toggle switch or dynamometer to choose. However, the squares provided for the rest of the subjects were identical. Those in the high-response-uncertainty condition were told that most people could distinguish the squares if they tried long enough. In a third condition, where determining the correct response was intended to be perceived as impossible, subjects were faced with the identical squares and told that only those with a rare visual trait could distinguish them.

Comparisons between easy-response-discrimination subjects facing either the low-effort toggle-switch task or the high-effort dynamometer task indicated that expected effort influenced pulse rate and finger pulse volume. This effect occurred as well for subjects in the impossible discrimination conditions. Furthermore, subjects in the impossible-task condition, who had no instrumental task for which to mobilize energy, showed lower reactivity than those in the high-effort condition. Thus the predicted nonmonotonic pattern was found as a result of variations in the effortfulness of instrumental behavior. (However, within the high-effort condition, response-discrimination difficulty did not produce a similar pattern. On the contrary, subjects in the high-response-uncertainty condition evinced lower rather than greater cardiovascular arousal. Wright suggested that perhaps those subjects facing the combination of the difficult response discrimination and the difficult dynamometer grip may have given up. If so, their motivational arousal should indeed have been low.)

The above studies demonstrate that anticipatory motivational arousal occurs in proportion to the difficulty of an instrumental task and is reduced when no effective instrumental behavior is available. The effects on cardiovascular reactivity were found whether the goal was appetitive or aversive, and whether the task to be performed involved motor or cognitive effort.

AROUSAL DURING PERFORMANCE Studies examining cardiovascular arousal during task performance have found similar results. Elliott (1969) measured HR in subjects who either could avoid shocks by lifting their hands off a shock plate, or could not lift their hands because they were strapped down. When the shocks were impossible to avoid, mean HR was lower than when subjects were actively attempting to avoid the shock. In a second experiment, subjects were given an appetitive goal (money) for correctly performing a tone-discrimination task. The tones to be discriminated varied in distinctiveness so that in the easy condition they were quite distinctive, in the moderate condition they were somewhat distinctive, and in the very hard condition, they were barely distinctive. It should be noted that subjects in this study *learned* the difficulty of their task as they performed it, rather than being informed ahead of time as in the anticipatory arousal studies described above. For subjects in the easy and very hard conditions, there was a decrease in HR over trials, but for subjects in the moderate condition, HR increased over trials.

Obrist et al (1978) gave subjects a reaction-time vigilance task that was instrumental in avoiding shock. Subjects were to release a telegraph key when they detected a tone. Difficulty was varied by imposing different reaction-time criteria. In the easy condition, subjects were to release the key within 400 msec (achieved on 671 out of 680 trials), while in the impossible condition, subjects were required to react within 200 msec (achieved on 30 of 646 trials). Subjects in the hard condition were told to release the key as fast as they could on the first trial (if they didn't, they would be shocked), and to increase their speed on each of the following trials.

Increases in HR and SBP across trials were greater for subjects in the hard condition as opposed to the easy and impossible conditions. DBP was not differentiated across conditions, a finding consistent with reasoning reported above.

A similar study (Light & Obrist 1983) used the same reaction-time task in an appetitive context. Subjects were promised $.20 each time they met the assigned criterion, which was again either easy, difficult, or impossible. Both HR and blood pressure were measured during a separate relaxation period and during performance. While adjusted SBP and DBP scores were lower in the impossible than in the easy or difficult conditions, the scores in the latter did not differ. A manipulation check revealed that subjects reported trying harder in the easy and difficult conditions combined than in the impossible condition, and roughly half of the subjects in the easy condition reported "trying their hardest" throughout the trials. Apparently the easy condition was not appraised as requiring less effort than the difficult condition, resulting in similar arousal levels. (Adjusted HRs also failed to differ between the easy and difficult conditions; and although they were slightly lower in the impossible condition, the difference was not significant.).

A purely cognitive avoidance task was employed in research by Scher et al (1984) designed to test cardiovascular responsiveness under conditions of varying difficulty and instrumentality. Subjects were given a test that required single-digit numbers to be mentally rearranged before they were repeated in reverse sequence. Electrocardiographic T-wave amplitude (TWA) and HR changes were monitored during a 15-sec anticipatory phase, as well as during each 15-second mental manipulation phase. (This ensured that the measures would reflect cognitive rather than physical effort; the digit recitation period was not included in the analysis.) Difficulty was varied for each subject by presenting either the maximum number of digits he or she had been able to rearrange during preliminary trials (easy trials) or presenting this maximum number plus two more digits (hard trials). Incentive (instrumentality) was varied by declaring that some trials would determine the administration of aversive noise while others were merely for practice.

Both HR and TWA responsiveness were more pronounced on difficult than on easy trials. Furthermore, the incentive factor produced even more pronounced effects: Subjects' reactivity was greater on trials thought to affect noise administration than on practice trials.

Cardiovascular changes during the anticipatory phase preceding each trial indicated that subjects were indeed more motivationally aroused before the test trials than before the practice trials. (Since subjects knew during the anticipatory phase whether they were facing a test or practice trial, but not how difficult that trial was to be, the latter factor was irrelevant in the analysis of anticipatory effects.)

The authors observed that in an earlier experiment (Heslegrave & Furedy 1979), a strikingly different pattern of HR and TWA change had occurred in anticipation of the possible administration of aversive noise. This anticipation period, however, had followed rather than preceded performance; subjects had already acted and were merely waiting for the results of their actions. Under these circumstances, TWA returned toward baseline, while HR decelerated below baseline. Scher et al argued that the differences in responsiveness during the two anticipatory periods were due to the difference between awaiting an "unmodifiable event" as opposed to "active preparation for performance."

The anticipatory effects in this study and the care taken to ensure that the task would be purely cognitive argue against the idea that differences in arousal are primarily due to differences in physical exertion during performance of easy or difficult tasks. Further evidence against this idea was found in research by Fowles and his associates (Fowles et al 1982; Tranel et al 1982). Subjects in the latter study were promised either no reward, $.02, or $.05 for every five button-pressing responses. Heart rate increased with increasing incentive, but response rate stabilized across trials such that there were no significant differences found between groups. The authors noted that the average subject in this experiment was moving his or her hand approximately 85 ft per minute. One might conclude that although subjects were differentially motivated, they reached a ceiling on response rate and were not able to perform any faster. The fact that HR did differ in this study and during the mental rearrangement period of the Scher et al (1984) study described above supports the view that cardiovascular reactivity occurs in response to differences in motivational intensity rather than differences in exertion.

Intended Effort

The difficulty of satisfying a motive can be operationalized in numerous ways, and many operations not intended to affect difficulty can be interpreted as doing so. Here we review evidence in research specifically designed to examine the role of motivational intensity (or at least satisfies the requirements of doing so). Generally, potential motivation and a variation of task difficulty must be involved, and dependent effects must be examined during or immediately before or after performance of instrumental behavior.

A variable that affects intensity but that may not itself depend on the immediacy of task performance is intended effort. Kukla (1972) offered an analysis of achievement behavior in terms of a cost-benefit judgment. As long as the individual believes an effort is worthwhile, the intended effort should be inversely proportional to the perceived probability of success (directly proportional to the perceived difficulty of the task). A somewhat different view has been offered by Meyer & Hallermann (1977) in which intended effort is said to be a function not only of perceived probability of success but also of perceived task skills. Meyer found that when probability of success (Ps) was defined in terms of a social norm, intended effort increased with Ps for those with low self-judged ability, and decreased with Ps for those with high self-judged ability. Regardless of level of self-judged ability, the peak of intended effort appeared to be at about .5 Ps. As we saw in regard to physiological evidence, and as we shall see in the remainder of this chapter, a variety of behavioral and subjective effects are consistent with the general proposition that intended effort increases as task difficulty increases, up to the point where successful performance becomes unlikely.

Behavioral Effects

DIFFICULTY NOT FIXED When the structure of instrumental behavior is such that the organism can determine the level of effort to be exerted, the intensity of motivation should vary directly with the magnitude of potential motivation. This is simply a formal statement of the obvious point that both human and subhuman animals tend to try harder when the stakes are great. But factors that interfere with goal consumption, such as delay of reinforcement, greatly moderate this relationship. For example, Wike & McWilliams (1967), Wike et al (1967), and Wike et al (1968) have shown that delay of reinforcement during training trials for rats running a runway for food grossly reduces the rate of running speed whether the delay is long or short, introduced early or late in training (but a delay frequency of less than 100% leaves running speed unaffected). There is no benefit to the rat that hurries, if it must nevertheless always wait.

A goal-setting study by Mowen et al (1981) makes a similar point in regard to human behavior. In this type of study, the goal is a performance level. Locke (1968) and his associates have shown that setting high goals for individuals produces better performance than, for example, instructing individuals to do their best. Mowen et al offered certain subjects a monetary piece rate and assigned them goals of low, medium, or high performance. Other subjects could earn a monetary bonus only if they reached their assigned performance goal. Those on the piece rate performed much better at the high performance-goal level than did those who had to make the set level in order to obtain the bonus. A piece rate allows the individual to determine how much of an effort to make, while the bonus for a certain level of performance promotes an all-or-none decision and the possibility that the individual will decide not to try.

GOAL PREFERENCES The achievement literature is rife with studies that demonstrate the preference of humans for performance levels of intermediate difficulty. While the reasons for this preference are disputed (Heckhausen et al 1985), a plausible reason not yet noted is that motivational intensity, which should be maximal at intermediate levels of task difficulty (depending on potential motivation), may make goals appear more attractive. This issue is discussed at length in the section on subjective effects, below. Here we describe one study done with rats simply to demonstrate the behavioral goal preferences that can occur.

Friedman et al (1968) reported an experiment in which rats were trained in a Y maze that had a difficult hurdle in the right arm. On half of the training trials the rats were forced to go to the right, on the other half, to the left. The goal box at the end of each arm contained either of two foods equal in weight and acceptability but disciminably different. For one group of rats there was no correlation between maze arm and type of food; for the other two groups the food associated with the difficult arm was always the same (food A for one group, food B for the other). Subsequent to training, test trials consisted of a free choice between the two arms of the maze with the same relationship between arm and food that had held for the animal during training. The rats that always found the same food associated with the difficult arm tended to continue to select that arm, while the rats that had experienced no correlation between arm and food tended to choose the easy arm. This result is consistent with the idea that the rats found the difficult-to-attain food (the goal) more attractive.

AMPLITUDE OF NONINSTRUMENTAL RESPONSES In order to examine the effects of energization on responses irrelevant to goal attainment, Esqueda (1985) confronted subjects with mathematical problems that were easy, difficult, or impossible. Successful completion of the problems would earn each subject a record album. Subjects wore earphones with an attached microphone in order to communicate with the experimenter, who was in a different room. In addition, they were required to write an identification number on each experimental form, and just before task performance, they had to push a button to notify the experimenter that they were ready. Measures of voice amplitude and time to write the identification number were taken before subjects learned the difficulty of their task as well as just before they were to commence the task. While there were experimenter differences on changes in voice amplitude, precluding use of those data, subjects who confronted a difficult math test wrote the number faster than did those who confronted either an easy or an impossible math test. Similarly, those who confronted the difficult test pushed the button harder than did those who confronted the easy or impossible test. Apparently, the motivational intensity produced in anticipation of performing a difficult task increases the amplitude of irrelevant responses.

The Yerkes-Dodson law (1908), which holds that performance is an inverted-U-shaped function of motivation, implies that motivational intensity can become great enough so that it interferes with performance. This would be particularly true of a complex task such as solving difficult anagrams. Ford et al (1985) tested this implication by giving subjects up to 100 sec to solve each of 20 anagrams, where the correct solution for each anagram would earn ten cents. Performance was measured in terms of the mean latency required to solve, failures to solve, and the number of trials required to learn that all anagrams were scrambled in the same pattern. On the assumption that subjects' rating of the attractiveness of the goal would indicate how motivated they were, subjects were divided into groups with low, moderate, and high motivation. As anticipated, those who were most highly motivated performed worse than did those who were moderately motivated.

AMPLITUDE OF RELEVANT RESPONSES Ach was particularly concerned with how people maintain their behavioral concentration (see Kuhl & Beckmann 1985). Düker (1963) tested Ach's notion that people try harder when their performance is hindered. In the first of two studies in which subjects practiced writing zeros daily until performance was automatic, during a 40-min experimental session subjects were asked to read a light philosophical work while doing the middle 20 min of writing zeros. In the second study, subjects were asked to simultaneously do mental arithmetic problems (addition and subtraction of three numbers) from the 5- to the 15-min mark, and from the 20- to the 30-min mark of a 35-min session of writing zeros. During the first period of mental arithmetic, the problems were done every 5 sec (relatively easy), while during the second period, problems were done every 3 sec (relatively difficult). In both studies subjects wrote zeros faster during the distracting task than during the pre- and postdistraction periods. Furthermore, the more difficult (3-sec) distraction task of the second study produced faster writing than did the easier one. Postexperimental interviews indicated that the subjects were unaware of their increased speed of writing during distraction. While these studies involved very few subjects (2 in the first, 4 in the second), the results are sufficiently dramatic and uniform to convince one of their replicability. Of course, the difficulty manipulation of the second study is confounded with order and time.

A study by Kukla (1974) provides additional evidence of the energizing effects of task difficulty. Kukla assumed that resultant achievement motivation can be interpreted as perceived own ability, with high achievers perceiving high ability, and low, low. Subjects classified as high, intermediate, or low in resultant achievement motivation were given complex mental arithmetic to perform, and were informed that the task was easy (95% should succeed) or moderately difficult (50% should succeed). They were then given 20 min to do as many problems as they could from a set of 252. Kukla reasoned that performance in this case should depend on self-perceived ability: high need-achievement subjects should find the "difficult" task more challenging and perform better on it than on the "easy" task, while low subjects should see the "easy" task as challenging and perform better on it, seeing the "difficult" task as impossible. The results accorded completely with these expectations. From the present perspective, however, either the differential achievement motive (potential motivation) or self-perceived ability, which would affect perceptions of task difficulty, could have produced this pattern of results. When the task is difficult, high potential motivation can make it worthwhile to try; low potential motivation can result in giving up.

LATENT LEARNING The learning of incidental or irrelevant material has frequently been used to demonstrate drive-like states. For example, Pallak et al (1967) and Pallak (1970) used latent learning to show the drive-like character of cognitive dissonance. The same technique might reasonably be used, therefore, to reflect states of energization that result from task difficulty. Hill et al (1985) had subjects copy familiar and unfamiliar first names, ostensibly for use in a sentence completion task, which in turn was made to look easy, difficult, or impossible. An unforewarned test of recall for the names produced the expected pattern of results. Subjects who confronted a difficult task, relative to those confronting an easy or impossible task, tended to recall more familiar (dominant response) and fewer unfamiliar (nondominant response) names.

PROTECTION OF THE SELF Effort to protect private self-esteem is seen in a study by Sigall & Gould (1977). The self-esteem of subjects was raised or lowered by false feedback on a supposed personality test. Subjects were then sent to another research room for what was advertised as a separate study. While the subject waited in the hall outside the research room, an ostensible other subject emerged from the research room and remarked to the subject either that the experimenter was very easy to please or that the experimenter was very difficult to please. Subjects were informed by the second experimenter that they were to solve a concept-formation problem, and they were given ten practice problems and told they could do as few or as many as they liked. The experimenter left the room, and the subject was surreptitiously observed. The high-self-esteem subjects were observed to do more practice problems for the difficult- than for the easy-to-please experimenter. In contrast, the low-self-esteem subjects did more practice problems for the easy-to-please experimenter. The pattern of results is strikingly similar to that for the solution of mental arithmetic problems by subjects in Kukla's (1974) experiment with high- and low-need achievers. It seems apparent in both studies that subjects with high self-perceived ability or esteem mobilize more energy for a difficult than for an easy task, while those with low self-perceived ability or esteem mobilize energy for the easy task, which they see as difficult, and not for the difficult task, which they see as impossible.

HELPLESSNESS Another topic of current interest is how people respond to situations subsequent to an experience of helplessness. The conceptual analysis presented in this review implies that helplessness experiences must affect either potential motivation or perceived task difficulty in order to generalize. For example, failure at some concept-formation problems is not likely to affect either food deprivation or the value of a chef's salad for relief of that state of deprivation. Only if the failure affects the perceived difficulty of obtaining the chef's salad (or otherwise reducing the state of deprivation) will there be some "generalization." Even then, the effect could just as well be intensified effort as depressed effort. The interested reader is referred to Ford & Brehm (1987) for a review and analysis of the helplessness literature.

Subjective Appraisals of Motivational Factors

Lewin (1938) stated that the strength of a goal's valence is a function of the amount of a person's need. While situational qualifying factors were noted, a general example is that an item of food looks more attractive to a hungry than to a satiated person. However, in a study performed in order to validate the use of the Thematic Apperception Test (TAT) as a measure of motivation, Atkinson & McClelland (1948) failed to find the anticipated supporting evidence. They had subjects go without food for 1, 4, or 16 hr before responding to a set of TAT pictures. Surprisingly, increased hours of deprivation had no effect on food imagery or thema, reduced thoughts about food consumption, and increased thoughts about instrumental activity. In the terms of the present review, increasing potential motivation results in thought not about the goal or goal consumption, but about instrumental behavior that would lead to the goal. Presumably, if a TAT measure were taken in immediate anticipation of instrumental behavior, goal and goal consummation thema would be a joint function of the difficulty of the instrumental behavior and the magnitude of potential motivation.

More recently, Mischel & Mischel (1983) examined the thoughts of children concerning delay of gratification. They found two basic rules that the children learned for effective delay: (*a*) cover rather than expose the reward and (*b*) engage in task-oriented rather than in consummatory ideation. We would conjecture that concentrating on the problem of delay rather than on the act of consummation is to focus on the fact that nothing can be done, which avoids motivational arousal.

The proposition of interest in the following sections is that the subjective appraisal of the strength of motivational factors such as desire or goal attractiveness is a direct function of relevant motivational arousal. Thus, food should look attractive to a deprived person only to the extent that the person is engaged in or about to engage in relatively difficult instrumental behavior to attain the food.

APPETITIVE OUTCOMES The first empirical investigations of goal attractiveness using appetitive paradigms were described in Brehm et al (1983). An experiment conducted by Solomon & Silka promised subjects $1.00 for correctly solving 8 out of 10 mathematics problems within 10 min. This experimental procedure was similar to that used in the Contrada et al (1984) research described above. As in that study, the problems were either at a high school freshman level or second year college level of difficulty, but there was also an impossible condition where problems were at the level of a PhD in mathematics. Subjects were informed of their difficulty level before they expected the 10-min trial to begin.

Measures of goal attractiveness were embedded in a questionnaire handed to subjects immediately before they expected to work on the mathematics problems. Subjects who expected to work on the difficult (college level) problems reported that the dollar prize for success was more desirable than did subjects in either the easy or impossible task conditions.

The researchers included in their questionnaire some items measuring mood states. Subjects in the impossible condition might have reported that the dollar was less attractive because they resented being offered a chance at the dollar and then given an impossible task. However, these subjects did not report anger. Furthermore, the correlation between perceived unfairness and goal attractiveness was .29, indicating that feelings of unfairness were not the major factor determining lowered ratings of the goal.

This experiment demonstrated a nonmonotonic effect of task difficulty on goal attractiveness. Of particular note is the methodology used to obtain subjective measures of attractiveness: Subjects were interrupted just before they expected to begin work on the task. Like the anticipatory arousal found in the studies reviewed above, goal attractiveness effects were expected to occur prior to commencement of instrumental activity. When there is something to be done, the organism should mobilize energy accordingly. Furthermore, the organism should become motivationally aroused only in proportion to task demands, and only when the task is imminent. The degree of this preparatory motivational arousal should correspond to the degree of subjective goal attractiveness.

This point becomes important when considering a dissonance-theoretic (Festinger 1957) explanation for the above results. To the extent subjects felt dissonance after deciding to expend effort to solve difficult problems, dissonance theory predicts that they would try to justify the effort required, perhaps by magnifying the attractiveness of the goal. For subjects who felt dissonance after deciding to work on problems that were impossible to solve, however, one way to reduce this dissonance would be to minimize the importance of failure by reducing the attractiveness of the goal.

However, such dissonance-reduction effects should occur at least as strongly after actual performance of the task in question. In contrast, the present discussion maintains that differences in goal attractiveness correspond to anticipatory mobilization of energy for instrumental behavior. Such differences should not persist after task performance.

An experiment designed to resolve this question was reported in Brehm et al (1983). Investigators Solomon & Greenberg again offered subjects $1.00 for successful completion of 8 out of 10 mathematics problems, labeled at either a high school freshman or second year college level of difficulty. One group of subjects was given the dependent measures questionnaire immediately before attempting the problems, while another group completed the questionnaire after performance.

While both the pretask and posttask groups reported perceiving the college level problems as more difficult and requiring more effort than the high school level problems, only the pretask group reported the expected differences in goal attractiveness. The pretask group facing difficult problems appraised the goal as more attractive than did those who were to attempt easy problems. The posttask group did not magnify goal attractiveness to justify their effort. Brehm et al (1983) concluded that the effects of task difficulty on goal attractiveness were indeed linked to anticipatory motivational arousal for instrumental task behavior.

As an example of a study that deliberately varied task difficulty in an interpersonal context, Wright et al (1984) told male subjects that each would have the opportunity to work with an attractive female if he qualified by memorizing a list of trigrams (three letter nonsense syllables) within two minutes. Subjects were told that they would be required to memorize either two, five, or eight trigrams. This was intended to create easy, moderately difficult, or very difficult task conditions. It was expected that an attractive female would provide sufficient potential motivation so that subjects would not give up even when the task was very difficult.

Manipulation checks revealed that subjects perceived these tasks as differing in difficulty, significantly so between the two- and five-trigram conditions. Unexpectedly, a nonmonotonic relationship was found between task difficulty and goal attractiveness, such that subjects viewed the female as more attractive in the moderately difficult condition than in either the easy or the very difficult conditions.

This pattern had been predicted for another target female who had been rated in pretesting as less attractive, and who was introduced as a goal to a similar group of subjects given varying levels of trigram list length. Instead, subjects rated this female as uniformly unattractive regardless of task difficulty.

These results can be interpreted with reference to the concept of potential motivation. Subjects who were promised the chance to work with the "attractive" female (moderate potential motivation) apparently viewed this chance as fairly attractive when they faced memorizing five trigrams, but not worth the effort of memorizing eight. Those whose goal was to interact with a less attractive female (low potential motivation) probably saw this opportunity as not worth energizing for, even in the five-trigram condition.

A subsequent study by Roberson (1985) also used a female target person and male subjects, but this time the subjects thought they were competing with another male to be selected by the female as a work partner. The male with whom the subject was to compete appeared to be socially inadequate (easy competition) or socially skilled (difficult competition). To create an impossible condition, some subjects were told that the other had already been randomly selected. As predicted, subjects who confronted difficult competition rated the target person as more attractive than did those who confronted easy competition or no possibility of being chosen.

A direct test of the effects of reaching the limit of potential motivation was carried out by Biner (1987). Here, potential motivation was deliberately varied by providing goals with differing objective incentive values; specifically, one group of subjects intended to work for a record album (high value), while the other group was promised $1.00 (low value) for successful task completion. Biner predicted that a very difficult task would require more effort than the dollar was worth, surpassing potential motivation and resulting in low goal attractiveness. However, the same level of task difficulty should be within the limits of what a person would be willing to do for a more objectively attractive goal, i.e. a record album.

Subjects within the two goal conditions were told they must memorize either 3, 8, or 45 trigrams to attain their goal. It was expected that attractiveness ratings of the record would be a linear function of task difficulty, because the very difficult task still would not exceed subjects' willingness to exert effort. Thus intensity of motivation and goal attractiveness should be highest in this condition. In contrast, ratings of the dollar were expected to decrease from the difficult to the very difficult task, since the latter was expected to exceed subjects' potential motivation.

These hypotheses were partially confirmed. Subjects rated the dollar as more attractive in the difficult than in the easy or very difficult conditions. They rated the record as more attractive in the difficult and very difficult conditions than in the easy condition, but not more attractive in the very difficult than in the difficult condition.

This evidence supports the assumption, described above, that a task may be viewed as possible, but as exceeding the amount of effort justified by the goal, and that subjective goal attractiveness will reflect this. Furthermore, the lack of a linear effect on attractiveness of the record may indicate that subjects intended to exert the maximum effort warranted by potential motivation in both the difficult and very difficult conditions.

Another implication to be drawn from potential motivation and the assumption of energy conservation is that when the difficulty of instrumental behavior is ambiguous or unknown, an individual should mobilize the maximum amount of energy provided by potential motivation. Thus, for example, when a person anticipates performing a task in order to attain a positive goal, but knows nothing about the difficulty of the task, motivational arousal and goal attractiveness should be as great as if the task were known to be difficult. Indeed, this effect was obtained in a condition in the above-reported experiment by Roberson (1985). Some of the male subjects who were competing with another male to be selected by an attractive female were told nothing about the social skills of the competitor. These subjects rated the target just as attractive as did those who thought the competition difficult. Similar results have been reported by R. A. Wright, A. Heaton, and B. Bushman (unpublished research).

An interesting extension of the effect of task difficulty on the appraisal of goals or desires is that a variation in difficulty may allow the assessment of what motives are producing behavior. In the controversy over whether helping is produced by egoistic or altruistic motives (e.g. Batson 1987), making it more or less difficult to help should produce differences only in the appraisal of whichever motive is operating. A study to demonstrate this implication was carried out by Fultz (1984), who tried to compare empathy-produced guilt avoidance with empathy-produced altruism. Because of weak manipulations, Fultz did a correlational analysis of his results. He found a weak but consistent pattern of subjective appraisals that suggests empathy produces altruism rather than guilt avoidance.

A further extension of the present analysis applies to the evaluations of choice alternatives. The selection of an alternative can produce anticipatory arousal if the alternative itself requires an immediate expenditure of effort. The obvious prediction, of course, is that the attractiveness of the chosen alternative will rise with anticipation of performance of the difficult task. If performance were to be delayed after the choice, then no rise in attractiveness would be expected. Just such an experiment has been carried out by White & Gerard (1981). They led subjects to expect to perform two different difficult discrimination tasks, and then, on the pretext that time was running short, asked subjects to choose between the two tasks. Following the choice, some subjects were informed that they would immediately start the chosen task, some were told there would be a 10-min delay, and others were told there would be a 30-min delay. Another group of subjects received the same information except that instead of being allowed to choose a task, they were assigned their preferred task. Ratings of task attractiveness demonstrated that the chosen task was rated relatively high in attractiveness, but only when it was to be started immediately. We would have expected the assigned task to show a similar increase in attractiveness, but there was only a slight trend in support of this expectation. Overall, however, these data suggest that the evaluation of an alternative can depend in part on the energy requirements of the alternative.

AVERSIVE OUTCOMES The studies described above demonstrate that variations in subjective goal attractiveness are linked to variations in the difficulty of attaining a *positively* valued goal. As with the physiological arousal studies, subjective effects corresponding to energy mobilization should occur regardless of whether the goal valence is positive or negative. As the difficulty of performing instrumental behavior to avoid an aversive outcome varies, the energy mobilized should also vary, within the limits provided by potential motivation. Subjective estimates of the aversiveness of the outcome should reflect the degree of motivational arousal.

The above study by Biner (1987) manipulated potential motivation by varying the objective incentive value of the goal offered. Since potential motivation is assumed to be a multiplicative function of need, incentive value, and perceived likelihood that successful performance will be rewarded, it is also theoretically possible to manipulate potential motivation by varying the latter. This should have the effect of creating situations where it is no longer worthwhile to mobilize energy for an outcome that may not be obtained. Subjective appraisals should be depressed under these circumstances.

Expectancy of motive satisfaction was varied in a recent study by Wright et al (1988b). This study threatened subjects with an aversive outcome that was milder than most of the preceding research had used. Subjects were told that they could avoid reading and being tested on their comprehension of scientific articles if they first successfully memorized some nonsense trigrams, *and* if they were lucky enough to choose a qualifying card from a deck offered to all who correctly memorized the trigrams. Thus even successful task completion did not guarantee avoidance of the aversive goal, but rather provided subjects with a chance at avoidance. This chance was varied by describing the qualifying card as any of 14 cards in the deck of 15 (high potential motivation) or as only one of the 15 (low potential motivation). In addition, task difficulty was varied by requiring either 2 trigrams (easy task) or 5 trigrams (difficult task) to be memorized in 2 min. When subjects announced they were ready to begin the memorization task, the experimenter instead handed them a questionnaire measuring their perceptions of task difficulty, likelihood of choosing the qualifying card if they performed successfully, and unpleasantness of the reading comprehension task. Results of these measures indicated that task difficulty and expectancy of motive satisfaction were successfully manipulated. Furthermore, the two factors interacted such that the reading rask was thought to be more aversive in the difficult condition, but only when potential motivation was high due to high expectancy. In the low-potential-motivation condition, both the 2- and the 5-trigram task produced relatively low task unpleasantness ratings. In other words, subjects with low potential motivation due to low probability of motive satisfaction did not mobilize energy to avoid the aversive task, and their subjective appraisals reflected this.

Wright (Exp. 2, reported in Brehm et al 1983) told subjects that they could avoid assignment to a punishment learning group where they would be shocked for each incorrect answer, if they first correctly memorized some trigrams within a specified time. In the easy-task condition, subjects prepared to memorize 2 trigrams in 2 min. Subjects in the difficult-task condition were given 6 trigrams to memorize in 2 min. In a task condition that was intended to be perceived as impossible, subjects were told they must memorize 20 trigrams within 15 sec.

It was predicted that there would be a nonmonotonic effect of task difficulty on ratings of the potential unpleasantness of receiving shocks. Energy mobilized to avoid shock would be greater in the difficult (6-trigram) condition, and thus the shock would be subjectively more aversive than in the easy (2-trigram) condition. If subjects perceived the 20-trigram task as impossible, they should mobilize little energy to avoid the shock, and unpleasantness ratings should be low.

In addition, providing a direct test of the assumption that energy mobilization and goal valence effects occur only in immediate anticipation of instrumental behavior, half of the subjects in each of the above groups were told that the memorization task was about to begin, while the rest were told that there would be a waiting period of about 25 min. All subjects were then given a "departmental form" asking their opinion, among other things, of how unpleasant it would be for them to receive a shock.

As expected, when subjects anticipated immediate task performance, there was a nonmonotonic effect of task difficulty on ratings of shock unpleasantness. Furthermore, the effect was found only in subjects preparing to memorize the trigrams immediately; no significant rating differences were found between task difficulty levels when subjects were told they must wait 25 min.

A further study assessing the effects of task difficulty upon goal valence in an avoidance context was conducted by Wright & Brehm (1984). In this case, the instrumental activity to be performed was a motor task; subjects were to squeeze a dynamometer. The experimenters told subjects that they must either (*a*) merely move the dynamometer dial (easy task), (*b*) exceed their maximum practice grip by 5 points (difficult task), or (*c*) double their maximum practice grip (impossible task). Failure at these tasks would result in exposure to a 2-sec blast of 108-decibel noise. All subjects were given a sample of the noise prior to the assignment of task difficulty.

This experiment was unique among those involving aversive outcomes in that it provided subjects prior experience with the negative outcome, attempting to reduce ambiguity about its objective incentive value. Furthermore, the dependent measures included self-reports on perceived arousal (Thayer's Activation-Deactivation Adjective Checklist; Thayer 1967, 1978).

Results indicated that subjects rated the loud noise as more unpleasant when they faced a difficult task than when they faced an easy task. This provided further evidence that task difficulty mediates subjective appraisal of aversive outcomes, and also evidence that the effects are found with motor tasks. In addition, on the Thayer ADACL subjects reported feeling greater vigor and energy, and less drowsiness, in the difficult than in the easy or impossible task conditions.

However, there was no significant decrease in noise aversiveness between the difficult and the impossible conditions. Furthermore, subjects in the impossible condition did not report significantly fewer feelings of tension or anxiety. Possibly these subjects had not reduced their motivational arousal due to a belief that instrumental behavior was useless, but instead were still searching for a way to avoid the noise.

Subjective judgments of arousal do not reliably correlate with objective measures of arousal (Elliott 1969; Houston 1972; Manuck et al 1978). Apparently, one's body can be preparing for instrumental behavior in the service of a goal while one remains relatively insensitive to the degree of change occurring. More direct evidence of the relationship between task difficulty and subsequent physiological arousal has been provided by studies assessing cardiovascular reactivity (discussed above).

Two that should be reviewed here are the experiments by Contrada et al

(1984) and Wright et al (1986). These studies examined *both* cardiovascular reactivity and subjective goal appraisals. While the former study failed to find any valence effects due to task difficulty, the authors reasoned that subjects may have been distracted from evaluating the goal by the presence of unfamiliar physiological recording equipment.

Wright et al (1986) attempted to prevent distraction by keeping a small light trained on the display case of pens offered as an incentive in their experiment. Both valence effects, as well as effects on SBP, were found. However, measures of subjective perceptions of arousal were taken, and these failed to reveal any effect of task difficulty. Once again, subjects were not particularly sensitive to their cardiovascular responses.

Although the research documenting the effects of task difficulty on goal attractiveness could be taken to be even more indirect than are self-reports as a measure of motivational arousal, this research is compelling because of its consistency. Goal-valence effects have been found, as described above, in both appetitive and avoidance contexts, and for a number of different types of goals. These effects interact with the limits of potential motivation such that subjective goal appraisal is *not* increased when a task requires more effort than the goal is worth.

CONCLUSIONS

Mounting evidence indicates that the analysis of motivational phenomena is aided by distinguishing between potential motivation (e.g. deprivation, the value of positive or negative outcomes) on the one hand, and actual motivational arousal, which is a joint function of the magnitude of potential motivation and the difficulty of the instrumental behavior necessary to satisfy the motive. Motivational arousal rises with increasing difficulty of instrumental behavior up to the point where the required effort is greater than is justified by the motive, or the required effort surpasses the individual's skills and abilities, at which point arousal drops to a low level. Evidential support comes from measures of cardiovascular reactivity, effort, and subjective appraisals of needs and/or potential outcomes. Conceptually, the present analysis applies to all kinds of motivations and all kinds of motivated behaviors.

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