PLAINTIFF'S EXHIBIT

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Human Behavior and Safety

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11—Human Behavior and Safety

The function of a safety professional in industry is to assist line management in achieving maximum production by preventing or mitigating work-related fatal or injury accidents. As discussed in the previous chapter, the occupational environment is composed of various interacting components, such as the worker, materials, and equipment. A comprehensive safety program addresses all aspects of the work environment and recognizes that each component interrelates in the work place. Consequently, a major responsibility of a safety professional is directed toward changing worker behavior in order to facilitate safe working conditions.

This does not reduce the importance of the other facets of a sound safety program—the safety professional is also concerned with safe design and plant layouts, safety devices on machines and use of such devices by employees, the wearing of safe clothing and use of protective equipment—all of which contribute to the reduction of disabling accidents.

When, however, in spite of every precaution on the part of the manufacturer of equipment, the supplier of materials, the supervisor, and the safety professional, accidents still occur, the human element emerges as an important factor. It takes working with supervisors and other line management, as well as individual employees, if accidents are to be reduced.

This chapter is designed to promote understanding of human behavior in the work environment. It complements the previous chapter, which emphasized designing equipment, controls, and jobs to fit the limitations of the human being.

Psychological Factors in Safety

Many topics that the industrial psychologist is concerned with are too detailed to be covered in this chapter. Some of them play a direct part in the success or failure of sound personnel procedures in industry, but they are not all directly related to safety, or they do not fall within the assigned duties of the safety professional. They may, as part of the regular personnel procedures, contribute indirectly to safety in the shop.

Psychological factors that influence safety program success are described in the following paragraphs.

• Individual differences. Individual differences are one of the ever-existent problems within industry. These differences are seen constantly. Yet, within the framework of differences in people are factors that are common to all, and therefore useful in dealing with work groups.

• Motivation. Understanding the motivations of people is important. To want something is motivation, but not to want something also requires motivation. To use a safety device to protect one's fingers from a saw is, perhaps, indicative of motivation for safe practices, but the desire to ignore a safety device because it might decrease production is also motivated. Conflicting motivations should also be considered in any attempt to understand human relations.

• Emotion. Humans frequently respond to their emotions. While emotions can be constructive at times, they can also be destructive—working to the detriment of both the individual and the safety program. Emotion can also interfere with the thought processes, resulting in behavior on the part of the individual that conflicts with a rational approach.

• Attitudes and attitude change. Industry has recognized the effect that attitudes can have on production, plant morale, turnover, absenteeism, plant safety, and the like. As a result, management has spent much time and money in determining workers' attitudes. Measuring, developing, and changing attitudes constitute a major problem for the personnel staff and psychologists—one of extreme importance to the safety professional.

• Learning processes. Finally, there should be concern with learning processes. Learning starts on the first day of birth, and in all of the topics previously mentioned, it plays a major role. One cannot understand motivation, attitudes, emotions, or even individual differences without some consideration of the learning process involved in bringing them about.

Much of the success of a safety program depends upon its acceptance by those to whom it is directed. Program acceptance in turn is dependent upon an understanding of the psychological factors which influence program success.

An effective exploration must find factors common to the group and upon which the safety professional and the supervisor can use to promote safe conduct on the part of all workers. The basic question is, "What factors associated with human behavior can be utilized to increase the

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effectiveness of safety programs?"

Each of the five psychological factors previously listed are important enough to discuss separately.

Individual Differences

When a chemist analyzes a chemical compound, he can accurately specify its exact nature and composition. When he uses this compound, he knows exactly what behavior he can expect. The action and reaction of this sample is usually the same as other samples of the compound he has analyzed.

When the psychologist studies human behavior, however, he is not dealing with the same degree of certitude as is the chemist. The psychologist does not know the composition of the agent he is dealing with—in many instances, he has very little knowledge of his subject's past history.

In addition, the behavior of one person is not the same as the behavior of another person. Person A in the sample is not equivalent to Person B, in the way one cubic centimeter of distilled water equals all other cubic centimeters of distilled water.

The known fact that people differ has been referred to as the "personal equation" or, more commonly, "individual differences." The personal equation presents many problems for both the safety professional and supervisor. The case is not hopeless, for within the framework of individual differences, certain general patterns common to a group do exist.

For example, human behavior is typically motivated. Regardless of what the individual does, there is usually some purpose underlying the behavior. The purpose, for example, may be to reduce some basic tension which must be resolved. The degree and nature of this tension depends in part upon the individual's values and perceptions. More about motivation later.

Here is another example. Even though each child develops at his own rate and to different levels of efficiency, each crawls before he walks, forms words before forming sentences, etc.

The general model used to describe such modes of development is the following:

$$B = f(S,E).$$

Behavior (B) is a function (f) of the present situation (S) and all previous experiences (E).

Whether or not an employee works safely depends *(a)* upon his present situation—is he rushed? fatigued? in poor health?—and *(b)* his past experiences—did he avoid accidents in the past? What amount of training does he have? Under this general model, the E variable and the S variable comprise individual personality (Tyler, 1965).

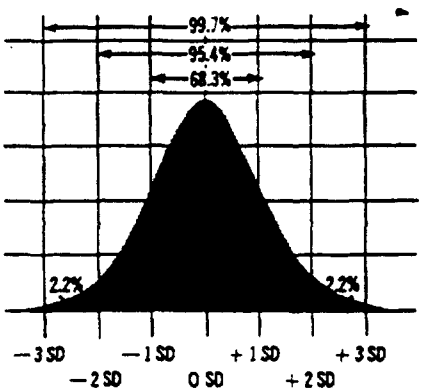

FIG. 11-1.—Many human characteristics are assumed to be distributed according to the normal curve shown here. Because the normal curve has a known shape, it is possible to state the percentage that lies between +1 and −1 standard deviation, or between any other two points expressed in SD units. Thus, it is easy to describe a normal distribution of data using the simple statistics—the mean (average) and the standard deviation, SD. For example, about 68 percent of all the measured values lies within ±1 standard deviation about the mean, 95% are within ±2 SD, and so on. Given the mean and standard deviation, therefore, the complete distribution of items in a normal distribution can be known.

The average-person fallacy

In the previous paragraphs, the point was stressed that each person differs from each other person (although there are certain common characteristics). The fact that individual differences exist should not be news. What is important is how one deals with individual differences.

Fig. 11-1 presents the distribution of scores in a normal curve. Many human characteristics (for example, anthropometric characteristics or IQ) are assumed to be distributed according to the normal distribution (often referred to as the "normal curve"). Note that in such a distribution, half of the persons are below the mean (the arithmetical average) and half of the persons are above it.

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Often the manager of an enterprise or director of a safety program realizes that individual differences exist and that it is physically impossible to handle every one individually. The manager or director may erroneously attempt the next best thing—appeal to the "average person."

Unfortunately, inept usage of the mean as the primary descriptive value of a population sample has resulted in misinterpretation and misuse of anthropometric data, culminating in the misconception of the so-called "average person." People, in reality, are highly unlikely to be "average." For example, in body dimensions, which can be measured more accurately than emotional, behaviorial, or intellectual characteristics (see the previous chapter), less than four percent of a group that was studied had three common average dimensions, and less than one percent was average in five or more dimensions at the same time. Therefore, when an appeal is aimed at the average, by definition it misses much of the population.

A better approach is the use of percentiles. When designing the system, instead of setting the standards to fit the average, design it to fit all but the upper 5 percent and the lower 5 percent. Then the system will fit 90 percent of the population.

The use of percentiles (for example, between the 5th and 95th percentile), rather than averages, has long been the technique for relating individual test scores to a group as a whole, and also a guiding rule in the design of man-machine relations.

Fitting the person to the job

Very often when managers are replacing or relocating personnel, they strive to find the individual possessing most of the characteristics deemed necessary. Job specifications and employee requirements are given in terms of a minimum, but very seldom are psychological factors expressed within a minimum *and* maximum; see the previous chapter.

When looking for someone, often the best qualified is considered to be the one who is most intelligent, most loyal, biggest, or whatever. In other words, they look for the perfect rather than the right person. For example, a person with a below-average IQ might be more desirable for a monotonous job than will a person with an average or above-average IQ. The amount of boredom, monotony, etc., may be less for the less bright, thereby eliminating carelessness, or other factors associated with poor productivity.

As an additional example, the person who comes to work under any condition, whether ill or not, may be as undesirable as the one who uses every excuse to take off. The worker with a high fever, bad cold, or sore back is a potential hazard, especially if he is under heavy medication.

Physical characteristics of the individual. Reaction time, psychomotor skills (for example, manual dexterity), and visual abilities seem to have at least some bearing on safe performance. While the extent to which they are directly responsible for accidents is neither clear nor constant, it appears that a certain minimum degree of physical competence is required for successful, accident-free performance. Some types of jobs demand superior physical abilities while others do not. It is not possible to redesign a job to allow a person with certain physical handicaps to perform efficiently and safely.

Most of the research to date has considered these factors individually. More recently a few studies have examined the connection between combinations of physical shortcomings and accidents. Such studies were initiated because investigators realized that physical and psychological abilities operate not as single, discrete items, but rather in interacting combination. For example, one study investigates the general perceptual skills and accidents, and not with just the separate abilities that contribute to perception.

Individual personality. It is the function of personnel people in industry to screen candidates on the basis of relevant characteristics required by the specific job for which application is made. In many cases, both (*a*) physical characteristics, such as size, visual acuity, and steadiness, and (*b*) personality characteristics are important, so many individuals will not be considered because they do not have all the necessary qualifications.

In the design of equipment, human engineering experts take into consideration physical limitations as well as other human characteristics in an effort to make machines as nearly perfect as possible. See Chapter 10 for a discussion of human factors engineering in relation to occupational safety.

Where hazards cannot be eliminated, guarding provides protection against potential failure of people to utilize equipment correctly. Both safe design and guarding minimize the effect of

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individual differences on accident frequency and severity.

Methods of measuring characteristics

Regardless of what technique is used to screen, place, and motivate employees, a method of measuring program effectiveness is necessary. Techniques used to obtain feedback range from the across-company accident rates, to the within-company approach of safety sampling, or critical incident technique, described on pp. 67-68, Examining accident causation, and in the next column.

Measuring techniques can be assessed by determining reliability and validity.

Reliability refers to consistency of measurement. The reliability of a given measurement, such as by a test or instrument, can be estimated in various ways. In general, however, the concept of reliability refers to measurement stability, whether it is *(a)* assessed across time or between settings, or *(b)* assessed using the same or different group of individuals, or *(c)* assessed for internal consistency or consistency between alternate forms of the same test or instrument.

Underlying the concept of reliability is that of measurement error. Any gauge used to assess performance will have, to varying degrees, associated measurement error. Measurement error refers to the estimated fluctuations likely to occur in performance by an individual or group as a result of irrelevant or chance factors.

The degree of reliability associated with an instrument or test is typically estimated statistically by a correlation coefficient. The sign of this coefficient refers to direction (either positive or negative) of the relationship; the value (e.g., r = 0.89) is an index of the magnitude of the relationship. Therefore, the greater the magnitude of the reliability coefficient is (and thus the less the measurement error), the more stable or consistent the results obtained by the instrument will tend to be (Anastasi, 1976).

Validity refers to the degree to which the test or instrument measures what it is thought or is purported to measure. The validity of a test or instrument can be assessed in various ways, such as *(a)* the relevance or plausibility of items (or the overall instrument) with regard to the given behavior (face validity), *(b)* whether all aspects within the rubrics of a given concept are adequately covered (content validity), *(c)* the extent to which the test or instrument may be said to measure a specific construct or trait (construct validity), and *(d)* a demonstrable relationship between the performance as measured by the given test or instrument and some other related behavior (e.g., IQ and school aptitude) (Anastasi, 1976).

Once again validity is expressed as a correlation coefficient. A negative sign, however, is as useful as a positive coefficient. An illustration might be testing for a job that requires very little mental ability—it may be negatively correlated with an IQ test so that the desirable workers for the job are those with the lower test scores.

A measurement may be reliable without being valid, but a valid measurement must also be reliable. To illustrate that a reliable measure may not also be valid, consider a yardstick. A yardstick is very reliable—it gives a consistent measurement every time it is used. It is also valid for measuring the length of a table. But if a yardstick is used for weighing the table, it is no longer valid for measuring.

In addition to reliability and validity, a measuring technique must be practical. A technique may possess high validity but be so cumbersome and intricate that it can only be used in special situations, and then only by highly skilled technicians. In spite of its statistical value, such a technique is almost worthless.

Two sampling techniques used for evaluating potential accident-producing behavior are *(a)* the critical incident technique, described in Chapter 4, and *(b)* behavior sampling.

- *The critical incident technique* involves the following. A random sample of employees is interviewed in order to collect accident information concerning near misses, difficulties in operations, and conditions that could have resulted in death, injury, or property loss. Those participating are asked to describe any of these incidents that has come to their attention; see Fig. 3–3 on p. 67. This technique can be useful in investigating worker-equipment relationships in past or existing systems, modifications to existing systems, or in the development of new systems (Hammer, 1972).

- *The behavior sampling* or activity sampling technique involves the observation of worker behaviors at random intervals and the instantaneous classification of these behaviors according

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to whether they are safe or unsafe. Calculations are then made to determine either *(a)* the percent of time the workers are involved in unsafe acts or *(b)* the percent of workers involved in unsafe acts during the observation period. Various components of a safety program (such as safety lectures, posters, brief safety talks, safety inspections, motion picture films, supervisory training) can be applied and an immediate indication of their influence on unsafe behavior can be obtained.

It is important that the safety professional approach any psychological evaluation with caution. Texts and references in industrial, social, and personnel psychology will provide guidelines for the development and use of test batteries for measuring individual differences. These tests or evaluative instruments are best developed and administered by competent professionals who specialize in this work.

With respect to the problem of screening employees or potential employees in regard to their accident potential, caution must be exercised. To date, no systematic screening procedures have been developed that meet both reliability and validity criteria and that are adequate for use in all industries or even in a specific industry. While in theory such a screening procedure is possible, the state of scientific knowledge in occupational safety research is too limited to support the development of such screening measures.

Motivation

Through the interaction of hereditary and environmental factors, each worker is an individual personality. The safety professional must be continually aware of individualities when dealing with human beings.

There are instruments by which various aspects of human behavior can be evaluated, many of which are already in use in industry. Through psychological tests, interviews, rating scales, and allied aids and techniques, personnel departments have for a long time been evaluating individual differences. Insofar as they are doing adequate jobs, personnel departments are working with safety programs to eliminate job candidates who obviously would be unsatisfactory.

Each day millions of men and women work in the manufacture and distribution of industrial products. It hardly seems logical that if all these people were individual personalities they could work together in harmony. Individual differences alone are not all there is to human behavior. There are some factors operating in all people which allow supervisors, safety professionals, and plant managers to obtain work and cooperation for a common cause. The psychologists, when they try to predict and control human behavior, are also concerned with these factors that all individuals have in common.

To have all personnel in a company from the president down to the lowest-paid employees working together productively and safely is one of the goals of a safety program. Such cooperative effort must be motivated as an appeal to achieve a common goal, or as a means to another goal which is of greater importance to the individual. In either case, the result is of value to the safety program.

It is understandable, therefore, that the question most asked by safety professionals and supervisors alike is, "How do we best motivate our workers?"

Complexity of motivation

Many theories contained in the psychological literature, to varying degrees, attempt to unify the concept of human motivation. Although not all of the hypothetical concepts associated with a given theory (nor all of the theories) are equally testable on an empirical level, several general concepts associated with human motivation are suggested.

The motivational problem is perhaps the most complex one in the field of human behavior. It is not possible at the present stage of development to give clear-cut, concise answers to all the questions that might be asked about other people's motivations. Rather, attempts are made to set forth some basic factors and point out where the complexities exist. Hierarchical motivation, multiple motivation, continuing psychosocial need, and conflicting motives must be considered.

Hierarchical motivation means simply that some needs take a higher priority—there is a hierarchy of motivational factors. It has been pointed out that the psychosocial needs (for example, recognition, affection, social approval) take precedence over the biological ones (for example, hunger, thirst, sex) when the latter are relatively well satisfied. This is but one aspect of the hierarchy of needs concept (Maslow, 1970).

The safety professional who plans carefully

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and takes each detail of his program to his boss for approval may be exhibiting an overwhelming desire for achievement and recognition, a desire much stronger than his need for affection. This is true particularly if human relations skills in dealing with workers are concomitantly ignored. He may be so concerned with personal achievement, and perhaps the recognition given for it, that plans are forced upon workers that they would not accept if they had the choice.

Another example is the worker who considers recognition as the major need that must be satisfied. This individual, perhaps, would go all out to become a strong militant leader of the union if he were to lose a promotion in the company. The safety director may actually be in conflict with this individual who may not care about the safety director's disapproval and instead values the affection and recognition of his fellow workers. This hierarchy can change over the years.

What is desired more early in life may assume less importance later. For example, the need for achievement and recognition perhaps is greatest in youth, thus giving a drive toward accomplishment.

Later in life the warm affection of friends or the security of belonging to groups may assume major importance if one has already had recognition for past work.

Multiple motivation is the second facet that complicates the analysis of behavior. People are seldom motivated by just one need--many forces operate at any single moment. For example at lunch time, one may eat because he is in need of food, or just because it is the usual time. However, an individual might delay his lunch in order to be joined by several friends. Thus the individual combined the satisfaction of a psychosocial need and a biological need.

In another case, an employee could desire recognition from his fellow workers and so engage in practical jokes and harmful horseplay. At the same time, he may be seeking recognition from his supervisor by working hard on the safety committee. The need is the same but the means of satisfaction are in direct conflict.

This is multiple motivation. It would be to the safety professional's advantage, in the second case, to recognize what the need is that the worker is trying to satisfy, and find ways to channel the behavior so he can achieve recognition from fellow employees and the supervisor.

Continuing psychosocial need is akin to biological need. However, people often assume that in the psychosocial needs, satisfaction at one time should suffice for the future and thus they need not be concerned any longer with giving recognition, or affection, or social approval.

For all people, these needs continue throughout life. Satisfaction is always sought for these needs, but not always attained. It should be apparent also that the satisfactions sought by individuals will not necessarily be for the same needs. At one time, the motivation may be for social approval while at another time the need most requiring satisfaction might be affection. Thus, in dealing with people, one must recognize that what was effective yesterday may not work today, although the satisfaction-seeking behavior is to some degree similar.

Being aware that these needs continually want satisfaction makes it somewhat easier for the safety professional or anyone else to deal effectively with people in the work situation. There may be variance from day to day so the safety professional must therefore cultivate his own ability, and the ability of supervisors, to work with people so that he can sense which needs require satisfaction at a given time.

Since they spend so much time together and with workers, the safety professional and foreman (or supervisor) come to know each other and the workers very well. This should provide the key to determining what a worker's behavior at the moment means in terms of need satisfaction. This key is based on little cues in the individual's behavior which they have learned over the years to recognize, if they have taken the time and made the effort to know their people.

Careful observation is required. Safety professionals should make certain that any supervisory training program includes methods of effective observation of workers.

Conflicting motives constitute another major problem in motivation--needs themselves can be in conflict with one another. Seeking affection could lead to behavior that might be different with fellow workers than with supervisors. It may be necessary to determine which source of affection is the most important to an employee before doing anything.

People can internalize these problems to such a degree that the resultant physical stress or even behavior is completely inconsistent with that

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typically expected of them. For example, an individual who is assistant safety director in a given company may strongly desire to become the safety director and yet at the same time be fearful of the duties, the responsibilities, and obligations of the job. The promotion would mean more prestige, more money—in all, a better way of life. Here then is a serious conflict. This individual's answer will depend greatly on his background experiences. One of the things he might do would be to quit his job and seek employment elsewhere. He might, on the other hand, seek training to better qualify for the position. He has many choices available.

The same applies to the worker on the line. He may strongly desire the approval of his supervisor and at the same time desire to remain an accepted member of his work group. If the work group minimizes the importance of the safety program, this worker now is in conflict. He may follow the group or he may seek the approval of the management. He may do one or the other, or he may do something entirely inconsistent with either.

Some conflicts can be solved rather simply, for the alternatives lead to positive need satisfactions regardless of which way the individual goes. These are really no problem. Others may have at one pole a positive satisfaction and at the other a negative or unwanted result. This is no problem either for the obvious choice is the one which is satisfying to the individual. Those choices that *cause* the problems are those that put an individual in a dilemma.

The solution depends upon how the individual has learned to work out such situations. Whether he runs away or faces up to the problem will give the safety professional or supervisor a clue as to what will occur in the future in a similar situation.

Job satisfaction

In the interest of further understanding of motivation in the work environment, many studies have been conducted to determine what constitutes job satisfaction in the workforce. Generally, these studies have sought to assess what workers claim to be the elements of their jobs that contribute to their satisfaction (or dissatisfaction) with their jobs. The results of these investigations suggest that the satisfaction of psychosocial needs rather than physiological needs may be the major motivational aspect of job satisfaction.

Table 11-A presents the results of a number of different surveys of job satisfaction. The numbers represent the rankings of the factors which were considered in each study. While different language and alternatives were used in each survey, the factors have been paraphrased to represent the elements covered in the surveys.

The results of these surveys suggest that high pay is not in itself a primary job motivator. Although workers expect a just and equitable income, they appear to expect only what others would be paid for comparable work. While the worker might feel dissatisfied if he were underpaid, higher pay alone does not guarantee job satisfaction (Clark, 1958; Adams, 1965).

On the other hand, steady work or job security does appear to be a primary job motivator. Workers want the security of knowing that on the basis of their performing their job well, they will have a job in the future. Job security, as a component of job satisfaction, may explain the willingness of a worker to maintain a low-paying, stable job instead of accepting a higher-paying, less-stable job.

Other factors which appear important as job satisfiers include—type of work, opportunities for advancement, and good working companions. Note that all of these factors seem related to the psychosocial needs of feeling important and belonging to a peer group which is acceptable to the worker. Likewise, comfortable working conditions (rated high by a number of employees) are probably associated with a desire of the worker to be treated humanely by the employer.

The results of these numerous surveys on job satisfaction are important when considering the safety program within the context of personnel policy. Inasmuch as the safety program is designed to ensure the well-being of the employee, it helps to maintain the employee's continued ability to do the work (which, in turn, gives job security).

Likewise, the safety program represents management's interest in the working companions and working conditions of the employee. All of these aspects of safety programming should be anticipated and incorporated into the approach which is taken with both supervisory staff and the employees. Honest and sincere positioning of the safety program within the context of the employee's welfare makes practical sense in light of our current knowledge regarding job satisfaction.

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TABLE 11-A

SUMMARY OF DIFFERENT SURVEYS ON JOB SATISFACTION
In Order of Importance of Different Factors

	Women Factory Workers	*Union Workers*	*Nonunion Workers*	*Men*	*Women*	*Employees of Five Factories*
Steady work	1	1	1	1	3	1
Type of work				3	1	3
Opportunity for advancement	5	4	4	2	2	4
Good working companions	4			4	5	
High pay	6	2½	2	5½	8	2
Good boss	3	5½	5	5½	4	6
Comfortable working conditions	2	2½	3	8½	6	7
Benefits		5½	6	8½	9	5
Opportunity to learn a job	8					
Good hours	9	7½	7	7	7	
Opportunity to use one's ideas	7	7½	8			
Easy work	10					

Management theories of motivation

As previously mentioned, there are many theories in the psychological literature that address human motivation. Within this literature, specific theories have evolved with special reference to management as it exists in industrial organizations. Two such theories are presented here, although other equally cogent points of view could be discussed.

Because theories of human motivation lack sufficient data to support all their tenets, they might best be viewed as philosophies of management. They are important to the safety professional because, if accepted, they can influence the direction in which management seeks to develop and implement a safety program.

Theory X and Theory Y

In an attempt to analyze how management personnel view human motivation, McGregor (1960) has evolved the notion that there are two basic ways in which management can view the worker. According to which view management accepts, essentially different management practices will be observed.

Theory X, according to McGregor, assumes that the worker is essentially uninterested and unmotivated to work. In order to resolve this condition, the motivation must be instilled into the worker by the adoption of a variety of external motivation agents. In effect, the worker becomes motivated to work by virtue of the external rewards and punishments which are offered to him.

For example, in order to create motivation, a Theory X manager might use any and all of the following—introduction of rules to constrict the worker's behavior, pay incentives based on production, and threats to job security associated with performance failure.

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Thus, under Theory X policy, management uses control and direction as the means of worker motivation.

Theory Y, according to McGregor, assumes that the worker is basically interested and motivated to work. In fact, work is assumed to be as natural and desirable as other forms of human activity, such as sleep and recreation. Under such circumstances, management is confronted with the role or organizing work so that the worker's job coincides with the goals and objectives of the organization. Thus, a Theory Y manager views the task as constructively using the worker's self-control and self-direction as the instrumentality for accomplishing the work to be done.

By emphasizing responsibility and goal orientation, management capitalizes upon the inherent motivation already present within the worker. If conflicts occur between the worker's goals and management's goals, they are resolved through mutual exploration and discussion. Always, under Theory Y policy, it is assumed that the worker's inherent motivation is essential to the completion of the organization's goals.

Both Theory X and Theory Y proponents exist, and apparently management systems operating on the basis of each of these theories can be found throughout American industry. What seems important is that whichever system is operating within an organization, it is necessary to recognize that safety programming can be initiated and implemented. While the technique of implementation may differ, Theory X and Theory Y approaches to human motivation can both be amenable to enhancing a worker's motivation to safe behavior.

Job-enrichment theory

Another analysis of human motivation in occupational environments has been developed by Herzberg (1966). While being quite comparable to the Theory X and Theory Y distinction, Herzberg has been explicit in both the detail and philosophy which he has evolved. His concept of job enrichment, in many ways an extension of Theory Y, is a major current force in management theory.

The classic approach to motivation concerns itself with changing the environment in which a person works—the circumstances that surround the individual while working (good or poor lighting, an agreeable or offensive supervisor), and the incentives given in exchange for work (money, a pat on the back, a writeup in the company bulletin, to name a few).

Hygiene Approach	Job-Enrichment Approach
Company policies and administration	Achievement
Supervision	Recognition
Working conditions	Work itself
Interpersonal relations	Responsibility
Money, status, security	Professional growth

FIG. 11-2.—Contrast of the hygiene approach to motivation and the job-enrichment approach.

Herzberg believes that the concern for environment is important—but not all-important. He says that it is not sufficient in itself for effective motivation. That, he contends, requires experiences that are inherent in the work itself.

Herzberg holds that there is no conflict between the classic (environmental) approach to motivation and his approach to motivation through work itself. He regards both as important. The classic approach is called hygiene whereas Herzberg's approach is called "job enrichment."

The hygiene approach may be understood by the following analogy—a person is provided with pure drinking water and waste disposal; both are necessary to keep this person healthy, but neither makes him any healthier. By extension, environmental factors always need replenishment. Good rapport may enhance an individual's job satisfaction, but job satisfaction alone will not necessarily result in safe work habits.

Fig. 11-2 presents a contrast of the classic hygiene approach to motivation and the job-enrichment approach.

Further, treating a person better does not enrich his job, although the individual may be unhappy if not treated well. Again, a salary increase may keep an employee from becoming dissatisfied for a time, but sooner or later another increase will be required.

Although there may be inherent hazards associated with a work environment, such as coal

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mining or bridge building, the worker has a right to expect controls to prevent the environment from becoming unreasonably unsafe, for example testing and removal of explosive gases, or safety nets and life lines. Such protection might not motivate him because it makes the job safer, but he might be very unhappy if he knew no effort was made to protect him.

Herzberg's idea that work itself can be a motivator represents an important behavioral science breakthrough. Traditionally, work has been regarded as an unpleasant necessity but it has not been thought of as a potential motivator.

Although automation is helping to phase out the unstimulating aspect of many jobs, a job should provide an opportunity for personal satisfaction or growth. When it does, it becomes a powerful motivating force.

People, Herzberg further theorizes, must be given the opportunity to do work that they think is meaningful. Merely telling an individual who is doing a routine job that he is happy and that he is doing something meaningful accomplishes nothing. But job rotation is not the answer, either; it does not enrich a job—it only makes it bigger.

Another point. Herzberg observes, "Resurrection is more difficult than giving birth." Obsolescence must, therefore, be eliminated by continued retraining—not just a once-in-a-while effort. Jobs should be kept up-to-date, and people doing the jobs must be kept up-to-date.

Even though a company may provide the hygiene factors, they must also provide a task that has challenge, meaning, and significance. If an unchallenged individual does not quit, he stays on—but with poor morale. That, says Herzberg, is the price a company pays for not motivating people.

In summary, seven principles of job enrichment can be itemized.

- Organize the job to give each worker a complete natural unit of work
- Provide new and more difficult tasks to each worker
- Allow the worker to perform specialized tasks in order to provide a unique contribution
- Increase the authority of the worker in his job
- Eliminate unneeded controls on the worker while maintaining accountability
- Require increased accountability of the worker for his own work
- Provide direct feedback through periodic reports to the worker himself

Frustration and Conflict

A motivated individual is one who is attempting to reach a goal. Often, however, a barrier is placed between the goal and the one who is seeking it. When this occurs, the individual becomes frustrated. This differs from mere *lack of satisfaction* of a need, which is called deprivation. Theoretically, the *thwarting of behavior* directed toward a goal results in frustration (Miller, 1959).

The barrier may come from within the individual himself. The person who sets impossible goals for himself may become frustrated when he is unable to reach the goals because he cannot work that fast. The "way out" may be an accident.

The barrier may also arise from the environment. An example—if the person mentioned above (who set a very high production output goal for himself) is unable to reach such limits because of faulty equipment.

A third type of frustration is caused by conflict. If two motives somehow conflict, the satisfaction of one means the frustration of the other. For example, the worker who sets high production and safety standards for himself, but is unable to meet both under the present system, must satisfy one and sacrifice the other.

It is to the conflict-caused frustration that we will now address ourselves. Basically, there are three types of conflicts—called "approach-approach," "avoidance-avoidance," and "approach-avoidance."

Approach-approach

As the label implies the "approach-approach" conflict arises when an individual is faced with two goals which are equally attractive, but only one of which is obtainable at the time. An example is the college student who has been asked to go both to a dance and to a swimming party on the same evening.

The approach-approach conflict is the easiest to resolve. No matter what goal the individual selects, a need will be satisfied, without much loss to another need. Usually the individual will resolve such a conflict by satisfying one need first and then satisfying the other. If the person is both hungry and sleepy, for example, he might eat first and then retire.

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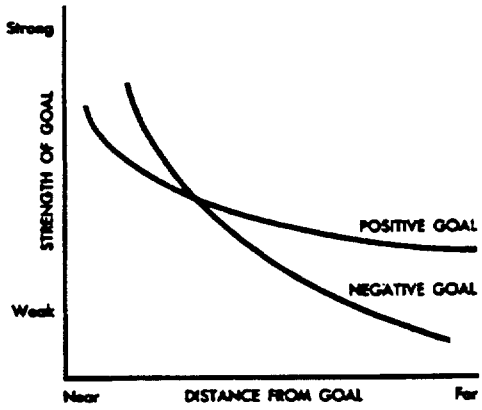

FIG. 11–3.—The approach-avoidance conflict is complicated by the different goal gradients for positive and negative goals.

Avoidance-avoidance

A second type of conflict is the "avoidance-avoidance" or double-negative conflict. This conflict may arise when an employee is told to wear heavy fire-retardant outer clothing in the summer heat or else risk the possibility of catching his clothes on fire. This employee is, as the saying goes, caught "between the devil and the deep blue sea."

Two kinds of behavior generally result from such a conflict—vacillation and flight.

In vacillation, the individual approaches one goal; retreats, approaches the other, retreats, and so on. As he approaches a goal, the unpleasant portions of the goal increase, so he withdraws. In the example, the worker may stall off doing the job requiring wearing the heavy clothing until the quitting bell sounds.

Another result from the avoidance-avoidance conflict is flight. The athlete may leave the field or the worker may quit his job. Quitting a job, of course, has serious consequences in lost prestige and lost income.

A more common type of fleeing, therefore, is in a figurative sense—like daydreaming, fantasy, etc. The worker faced with an unpleasant task may repress the reality by daydreaming.

The avoidance-avoidance conflict is not as easy to resolve as the approach-approach, nor is it as difficult as this next conflict type.

Approach-avoidance

The "approach-avoidance" conflict is the most difficult to resolve. The individual is both attracted and repelled by the same goal (Fig. 11–3). The worker who is striving for top production may be forced to take unnecessary risks to achieve that goal. One way out of such a conflict is by erasing or weakening one of the signs, thereby altering the individual's internal motivational system.

Approach-avoidance conflict refers to a single goal having both positive and negative attributes associated with it. Other things being equal, the strength of the approach or avoidance tendency will depend upon the proximity of the individual to the goal. At point A, for example, the tendency to avoid (or retreat) will be greater than the tendency to approach (since, as shown, the slope of the negative goal gradient is steeper than the positive goal gradient at point A). At point B, however, the tendency to approach the goal will be greater than the tendency to avoid. According to this theory, conflict will lead to retreat, vacillation, or indecision. Theoretically, the approach-avoidance conflict, and more complex double approach-avoidance conflict situations (that is, two goals, each mutually exclusive, having positive and negative attributes associated with each), are thought to be common situations (Miller, 1959).

Reaction to frustration

In most cases, the conflicts described will lead to frustration. This frustration may often lead to positive, constructive resolution of the situation. For example, the individual who is facing the conflict of top production, but at increased risk, may develop a new system for processing the product at a faster *and* safer rate.

On the other hand the frustration often leads to some negative form of behavior, a few examples of which are listed next. This is by no means an exhaustive list, nor are they mutually exclusive; one may appear in combination with another (Dollard & Miller, 1950; Miller & Dollard, 1941).

Aggression. This form of behavior is characterized by some type of attack toward another person or object. The four-year-old boy who beats his playmate over the head with a baseball bat is obviously exhibiting aggressive behavior. The forms of aggression of adults can be overt, physi-

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cal, or verbal. They can also be disguised; the tidbit of shop gossip, or the subtle comment by an aspirant for a promotion about one of his possible competitors, could be just as devastating to the victim as the baseball bat.

Regression. Regression is the tendency for an individual who finds himself in a frustrating circumstance to revert to an earlier form of behavior, such as putting on a temper tantrum or pouting. Such behavior most likely would occur in the case of an individual who, during his formative years, found that such behavior worked; in other words, he got his way by a display of temper.

Fixation. In fixated behavior, the individual persists in a particular kind of nonconstructive behavior even though it is clear that the behavior is inadequate to resolve the problem. Thus, a mechanic may persist in trying to fit a bolt in place, even though he realizes that it is the wrong size.

Resignation. Resignation is the tendency for an individual to give up—to withhold any sense of emotion or personal involvement in the situation. Failing to achieve some goal, this person loses any positive concern about his job and adopts an apathetic attitude toward the situation.

Negativism. In this form of behavior, the individual adopts a negative, resistive position with respect to the situation. A person whose suggestions have not been accepted may take a dim view of any other ideas.

Repression. This behavior is characterized by blocking out from consciousness those cognitive associations that are disturbing. It is an unrealistic form of behavior because it implies that the problem will simply go away if one does not think about it.

Withdrawal. In this type of behavior, the frustrated individual simply removes himself from the situation in question—either physically or psychologically. A person who is not able to cope with a business adversary may avoid situations which would put him in contact with the individual. An individual who is the butt of jibes and jokes may become a loner.

Emotion and frustration

Negative emotions can have a disturbing influence upon a person's behavior. Anxiety is one emotional reaction which, because of its distracting influence, its stimulus to heightened reaction, and its generally upsetting effect, can make an individual more susceptible to accidents. This general upsetting feeling can be spread to others working in the same situation and create an atmosphere not conducive to safe procedures.

Anxiety, however, is but one kind of emotional pattern shown by individuals in the face of frustration. The anxious individual is worried, circular in his thinking, and fearful in such a way as to make his behavior inadequate to reach his goal. Even though the individual himself may realize that his behavior is getting him nowhere, he is unable to find a method that will solve his problem.

In frustration, some people become angry, some fearful, and some accept frustration as a challenge and attempt to solve the problem. Most people who react emotionally to frustration and threat find it extremely difficult to cope with life situations. It is not necessary to discuss the physiological pattern which develops in emotion for everyone is familiar with the feelings experienced during fear, anxiety, anger, shame, and other emotions. Rather, one needs to recognize that over the years people have developed accepted social expressions for emotions. To some degree, one individual can be aware of how another is feeling. This is not to say that one cannot be fooled or that the outward expression always truly indicates the feelings of the individual. Many people learn to mask their real feelings.

However, after day-to-day interaction over a long period of time, one may learn to tell the difference between internal feelings and those expressed. This is useful to the supervisor and the safety professional in his dealings with individuals in the shop. As they go about the plant carrying out their normal duties, they may discover those individuals having difficulties and take some extra precautions to avoid accidents.

It seems important to make note of the problem of behavior disorders within the context of employee problems. Individuals whose normal behavior is seriously disrupted or whose ability to react to frustration is seriously impaired may require professional services beyond the scope of the normal supervisory-employee relationship. Although a supervisor should assist in directing the employee to inplant services or outside agen-

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cies, he should avoid attempting to deal directly with psychological problems requiring professional care. While the current movement toward company-sponsored psychological services may grow, it is unlikely to be the standard in all industries in the near future. For a detailed discussion of industry programs for drug abuse and alcoholism, see Chapter 21, "Occupational Health Services."

Non-directive counseling

Although no attempt can be made here to train safety professionals or supervisors to become personnel counselors, they can do much to help reduce the immediate result of strong emotion. The supervisor is in the best position to evaluate the emotional level of an individual worker and to do something about it.

Everyone is familiar with the emotional outbursts of people who have had a trying and upsetting experience. Such expression of emotion may take many forms from an outburst of bad language, a torrent of tears, to physical assault on inanimate objects which cannot strike back. The end result is the same—relief from the intolerable tension, and emotional relaxation.

The supervisor can sometimes alleviate work-related tension by providing an employee with an opportunity to talk about whatever is bothering him or her. This may be especially helpful if the problem is work-related or concerns a minor personal problem. The freedom to say what the individual pleases, without the evaluation of the supervisor, can reduce tension and open communication channels.

The stresses which cause emotional upset can occur within the work environment or away from it, but each kind has its effect on the other. A simple statement, such as "How are you today?" or "What's bothering you?," may well be sufficient to set off the verbalization of pent-up emotion. Ater the discussion, the employee can often evaluate more clearly and realistically the things that upset him in the first place.

To attack the problem at the roots calls for permissive listening on the part of the employee's immediate supervisor. In his normal routine every supervisor has an opportunity to talk with individual employees. Through the use of open-ended questions (those that do not allow for a simple yes-or-no answer) an employee is encouraged to discuss his problems. The supervisor needs to listen not only to words but the feelings they carry. He must give his attention to the unspoken language of facial expressions, gestures, bodily postures, and the like. This will bring him closer to understanding the attitudes and strength of feeling attached to them.

In such face-to-face discussions or interviews, it is inappropriate for the supervisor to argue, caution, evaluate, or cajole the employee, but rather he should try to reverbalize and reflect the expressions of feelings and attitudes. Having ventilated the emotion, this reflection will give the employee a chance to reevaluate without emotion his own position. He will thereby come to make a new appraisal of the situation more in line with the requirements of objectivity.

Frequently it is impossible to discuss such matters at length in the work area, so the supervisor should set a time and a place away from other employees to allow the individual freedom of expression. Even though the supervisor may not have a completely private office in which to engage in such kinds of interviewing, some place can be found for a quiet face-to-face discussion.

This relationship between the supervisor and the worker must be one of the supervisor's normal everyday functions. Diligent observation and effective and sensitive listening should be tools of every supervisor.

Attitude and Attitude Change

Although many existent psychological theories address attitude and attitude change, many basic concepts are still controversial. For example, whether or not attitudes are a precursor (or antecedent condition) of behavior is largely an unresolved theoretical issue in social psychology. Many theories on attitude formation and change assume an active behavioral role, that is, attitudes consist of three components, knowing-feeling-acting. Thus, such a theoretical approach distinguishes, yet integrates, such concepts as knowledge, emotions, and behavior or behavioral tendencies. Other theories regard attitudes as the delineation of values toward something or someone. Most of these theories agree, however, that attitudes (at least in part) are a disposition to evaluate objects, persons, or situations favorably or unfavorably (McGuire, 1969; Insko & Schopler, 1972).

What an individual's response can be is dependent, in part, upon the previous experiences of the individual. For example, if an individual sees a

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TABLE 11-B

FACTORS ASSOCIATED WITH PERSUASIVE COMMUNICATION

Attitude-Change: Situation Types	Communication Process	Attitude Change: Behavioral Step
1. Suggestive	1. Source	1. Attention
2. Conformity	2. Message factors	2. Comprehension
3. Group discussion	3. Channel factors	3. Yielding
4. Persuasive messages	4. Receiver factors	4. Retention
5. Intensive doctrination	5. Destination factors	5. Action

Source: McGuire (1969).

person on the street who resembles a friend, he immediately may smile, make friendly gestures, and have a warm quality in his voice. When that person is perceived to be a stranger, there is an immediate change to another facial expression, gesture, voice quality, and so on. Anticipated reaction can be set off by a certain look from another person, a manner of speaking, a mustache or the lack of one, the color of hair, or kind of handshake. All individuals have certain feelings about these and may act in accordance to their attitudes, as these have been formed over the years.

Some of these attitudes are latent. The predisposition to respond will lie dormant within the individual until called forth. Given the appropriate stimulus, the attitude shows itself and the behavior exhibited is in accordance with the feelings of the individual. A certain word, for example, connotes different responses in different people. The words "union," "management," "labor," and even "safety" carry with them certain connotations that touch off different attitudinal reactions in individuals, depending upon the kinds of experiences they have had with the subject.

Because attitudes play such an important role in everyday relationships, consideration should be given to their development, their effects on individuals, and what can be done to change them.

Determination of attitudes

Direct personal experience is thought to be one determinant of attitudes. In other words, experiences that individuals have had in the past, especially those involving strong associative emotions, determine attitudes. For example, the attitude of a worker toward management or his supervisor may be fearful and hostile if the worker has lost jobs for no apparent reason, as he sees it. There may have been sound reasons for his dismissals or layoffs, but to admit this to himself would be a threat to his own pride, and so he puts the blame elsewhere. Because of the effects that these dismissals have had on him and his family, such as causing financial stress, he may become very angry. Management to him now is a menacing thing, and thus the cause of his present hostile and fearful attitude.

Many people have had experiences that were associated with fear, sorrow, pain, or happiness. All of these will tend to make them react the same way to anything that is similar to the original emotion-provoking situation. Although there is only one positive emotion listed among those just mentioned, it is not to be concluded that most attitudes are negative, for there are many positive ones.

Attitude change

Factors associated with communication-induced attitude change are numerous. In summarizing the large body of psychological literature on attitude formation and change, McGuire (1969) suggested three components of attitude change (see Table 11-B). These include: types of attitude-change situations (column 1), variables associated with the communication process (col-

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umn 2), and communication outcome (column 3).

- Relevant situational factors include: suggestive situations (where the desired attitude is repeatedly presented), conformity (where social or peer pressure is used to elicit the desired response), group discussion, persuasive messages and intensive doctrination. Each situation is associated with varying degrees of attitude change. Also, distinctive implications of each is dependent upon the type of communication variables involved.

- Source variables refer to characteristics associated with the person or represented organization presenting the message. The effect of the message on subsequent attitudes can vary as a function of the perceived credibility, attractiveness (for example, liking, familiarity), and power of the message (that is, inclusion or exclusion of basic pro and con issues), the order in which specific issues are presented, and dissimilarities between the presenter and recipient of the message. Channel factors consist of the mode of presentation, for example, direct personal experience, mass media. Receiver factors include active participation, and degree of influenceability of the audience. Destination factors refer to the degree of post-communication message decay across time, and time latency associated with delayed-action.

- According to McGuire (1969), the receiver (or audience) must proceed through the following steps in order for attitude change to occur. These are: attention, comprehension, yielding, retention, and action. According to this model, each step depends on the occurrence of the preceding one.

To add to the complexity, the communication variables, especially in daily situations, can interact with one another. And too, the sequential step process may have more intuitive than empirical support. Nevertheless, this conceptual framework should highlight the implications (e.g., difficulties or dangers) associated with oversimplifying or making broad unsubstantiated generalizations about the process of attitude change.

Organization development. Concern for the amount and rate of change within our technological society has focused on the industrial environment and its ability to withstand such change. Behavioral scientists have evolved an approach, called "organizational development," which attempts to assess a corporation's ability to adjust to such conditions as rapid and unexpected change, growth in size, increasing diversity, and management system problems. Organizational development, which generally has as its goal the implementation of an educational strategy, is designed to alter the attitude and structure of organizations so that they can better adapt to a changing technology.

Mechanical Systems	Organic Systems
Emphasis upon individual performance	Emphasis on relationships in group
Chain of command concepts	Confidence and trust among everyone
Adherence to delegated responsibility	Adherence to shared responsibility
Division of labor and management	Participation in multi-member teams
Centralized management control	De-centralized sharing of control
Resolution of conflict through grievance procedures	Resolution of conflict through problem solving

FIG. 11–4.—Organization development seeks to implement organic systems in place of mechanical systems within organizations.

Generally, organizational development uses initial feedback of the employees and management to determine the climate and capacity of the organization to adapt its objectives to the technological environment. Based upon such feedback, an attempt is made to develop organic systems to replace mechanical systems within the organization. Organic systems are characterized by a preoccupation with people as they operate together whereas mechanical systems are characterized by a preoccupation with the structure that operates within a system. Fig. 11–4 presents a summary of the differences between mechanical and organic systems. In the final analysis, organizational development rejects bureaucracy as an organizational model and substitutes a model based on interpersonal competence.

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In order to implement the ideas represented by organizational development, a number of procedures are used to effect changes in the organization. Since the changes are typically people-oriented, due consideration is given to the need to motivate acceptance of the changes within both management and work groups. Typically, such techniques as sensitivity training, confrontation groups, and transactional analysis are used to effect reorientations within the organization's staff. These techniques have merit in implementing change only so long as top management concurs with the changes and provides incentives within the organization for their adoption.

Ultimately, organizational development seems to provide the necessary means for preparing an organization for orderly planning for the future. Included in such an effort should be the recognition of how changes in an organization will affect the current safety program. By adopting widespread involvement of all elements of the organization in safety programming, it is likely that safety programs will be able to meet the future needs of modern organizations.

Structural change

In the previous discussion of attitude formation and attitude change, no direct relationship between attitude change and behavioral change was assumed. In practice, however, safety personnel are interested, for example, in changing an employee's attitude regarding the wearing of protective equipment only so long as such an attitude change ultimately results in the employee's actually wearing the equipment. While the research literature indicates that a variety of influence efforts (training and counseling for example) can change attitudes, there is much less support for a direct relationship between attitude changes and subsequent behavior changes.

In effect, it is incumbent upon the safety professional to consider techniques other than attitude change when considering changes in the employees' behavior. Evidence suggests that it is possible to change behavior by the introduction of structural changes within the work environment. Structural changes are procedures designed to change the organizational constraints which operate within work groups. Examples include: changing job contents, modifying the physical arrangements of work, changing worker interaction patterns, and rearranging work procedures.

In each case, other than an approprate introduction of the change, it is not necessary to expend the time and effort to change attitudes prior to changing behavior directly. Rather, the introduction of the structural change can modify behavior directly and possibly, in turn, attitudes may change.

While there has not been an extensive attempt to apply the structural change model in occupational safety, it warrants consideration in the future. Human behavior can be changed by eliciting the change through the very circumstances under which the individual works. Unsafe acts, for example, cannot occur where the conditions of the work and work groups preclude their occurrence.

Learning

Learning underlies much of what makes for differences and similarities among people. Through learning, people have developed certain kinds of psychosocial needs, habitual patterns of behavior, ways of reacting to emotion, and the attitudes which they bring with them to industry. It is important to consider learning and the laws that affect it. This is especially vital in any discussion of safety, because training is a major consideration in safety programs.

Often, to change behavior, one must substitute new learning for old habits (Hulse, Deese, and Egeth, 1975). To change behavior in need-satisfaction sequences, one must teach better ways by which the goal can be achieved. In each case, some new learning must be substituted for old.

Motivational requirements

Repeatedly in everyday living, people recall many things which they did not set out to learn. While unintentional learning does occur, it is the intentional kind of learning in which the safety professional is primarily interested.

In educational systems, great emphasis is placed upon making the individual want the knowledge which is available to him. Materials are designed to relate to practical situations. Teachers attempt to make the individual interested in the material as such. To teach a student something about angles or distances, the teacher may use a baseball diamond as an example. Teachers try to tap motivation to increase the possibility that learning will take place.

The safety professional must recognize that if

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his workers are going to learn safe procedures, his workers must be motivated. To merely point out that accidents cost the company money will not motivate them. Rather, point out the hazards that are risked when using unsafe work procedures—the probability of serious and painful injury, the possible loss of earning power and the effect on his loved ones. The cost, not only in dollars but also psychologically to both the worker and his family, is of paramount importance to him and will motivate him to learn safe work methods.

It is not wise to assume that, because management sees the value of safe procedures, the worker will also. Management may be motivated to start a safety program because it will reduce insurance costs, reduce the amount of waste, and increase the number of units produced. Workers cannot be expected to desire it for the same reasons. In selling a safety program to the employees, one must capitalize on the things which will motivate them. Here the safety professional can capitalize on the needs discussed previously, and he probably can find many more which are consistent with the aims of the safety program. Everything that will motivate the worker to learn the right procedures should be used. (The next chapter discusses this in more detail.)

Principles of learning

Some consideration of basic principles is valid whether the learning is to be done in a college classroom or in a work area. When training procedures utilize these principles, learning is more efficient and thorough.

Reinforcement. Through experimentation, psychologists have found that reinforcement can often facilitate learning. In practice, reinforcement can, for example, make work more efficient and more productive. When a worker's pay increases because of more units of production, he is receiving reward for his learning. This can have negative aspects as well—the worker who figures out a hazardous short cut, which produces more units, may be rewarded for an unsafe act, as was mentioned earlier in this chapter.

It is apparent that the employee must be rewarded only for safe work methods. Higher productivity because of safe work methods satisfies the need for achievement and recognition. This in itself reinforces the learning of the employee, but also spreads its effect to other employees who see this take place. A supervisor by recognizing the same needs, however, can reinforce this learning through praise for greater productivity and telling the worker how much better he is doing, for example.

The publicity given to a safety record, a bonus, a promotion, or anything which satisfies individual needs would serve as a reward to reinforce whatever learning has brought about the desired behavior.

Reinforcement tends to be more effective if it closely follows the desired behavior. Praise, for example, should be given at the time the desired behavior occurs, or if delayed, associated verbally with the desired behavior. This does not mean it must be instantaneous, but it should be within a reasonable length of time. If delay is necessary, certainly recall to the individual the reason for the reward.

Reinforcement will often increase the likelihood of a reoccurrence of the desired behavior. Shortcut hazardous methods or any deliberate unsafe acts must not be rewarded. In fact, in such situations reprimands or punishment may be more appropriate. In short, unsafe methods should be corrected by full and complete explanation and demonstration of safe work procedures. Such being the case, it also follows that there should be reinforcement of the new correct work pattern as soon as feasible.

This principle also applies to participation by employees in a safety program whether it be through suggestion systems, safety committees, discussion groups or training sessions. In all these areas an individual gains personal worth if his opinions are asked for and graciously received.

A safety program that gathers the ideas of all, either individually or by representation, satisfies the need people have for being "in the know." In this way, the safety professional may create a positive atmosphere about the program and a sense of obligation and responsibility for its success. Research has demonstrated that when employees feel that programs come from all, there is more chance for success.

Research on the effectiveness of punishment suggests that punishment can have diverse consequences. Punishment generally is thought to be less effective than reinforcement, perhaps because punishment provides indirect cues or information, i.e., what not to do; as opposed to positive reinforcement (i.e., reward) that provides direct information about the desired behavior

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(Church, 1963).

The rewarding of correct procedures will lead to a more positive attitudinal response on the part of the worker than any punishment. A positive attitude toward training procedures is much to be desired. Both the positive and the negative aspects of reinforcement may generalize over the whole work situation. The supervisor's praise for a particular thing well done may spread over other aspects of the total situation, including training procedures, safety devices, and the safety program. The proper use of rewards thus can lead to efficient methods.

Much of the practice underlying programmed instruction (see Chapter 9, "Safety Training") is based upon the reinforcement concept as well as the other principles of learning which follow.

Knowledge of results. Closely allied to reward—in fact, one aspect of reward—is knowledge of results. Everyone likes to know how he is doing on a particular job. Letting the individual employee know how well he is getting along in his training program will likely motivate him to continue training and do a better job. To train a worker and not inform him of any improvement is defeating one's own purpose. It cannot be contended that the only one who needs to know about the effects of training is the supervisor or the safety professional. When the worker knows that this new procedure is helping him get greater production, he is getting reinforced for his learning and effort.

One of the factors which appears in some kinds of learning is a plateau at which learning levels off for some time before again showing an increase. Often some individuals become discouraged and learning can be retarded. If the trainer understands this phenomenon and indicates to the individual that a leveling off had been expected and that an increase will come later, the discouraging aspect of such a plateau may be avoided, with learning then proceeding more easily and efficiently. Demonstrating to the worker the achievements he is making through production curves, which are in effect learning curves, gives the worker knowledge of results, and this is a motivating factor for future learning.

Practice. The safety professional is interested in developing in an individual safe habit patterns which will become almost automatic in his work methods. Merely putting a worker through sufficient training sessions is not enough. Despite his apparent mastery, the next time through the work he may make one or more mistakes. To make sure that habit patterns are firmly entrenched, the worker must practice. The Job Instruction Training programs include one of the important aspects of training, namely, followup by the foreman. This is for no other purpose than to ensure mastery. Within a reasonable time, depending on the job complexity, this followup may become unnecessary.

Take, for example, a simple task such as bicycle riding. A youngster, in learning to ride a bicycle, needs to know how to balance, how to get on, how to get off, and how to stop, and he must learn all of these things as part of the total process. Perhaps he begins with balancing, then the start and stop, and then how to get on and off. Once he has accomplished all of these, he is not immediately left to himself. He needs several more sessions to make sure that he is doing it correctly. This, in effect, is reinforcement by practice. Furthermore, the youngster himself keeps practicing each time he goes out to ride. So it is also with the individual on the job.

Whole vs. part learning. Whole or part learning has been a knotty problem for industrial trainers for many years. Whether trainers should teach the procedure as a whole or break it down and teach it part-by-part is the question. There is no best answer. Both methods have advantages and disadvantages depending upon: job complexity, the trainee, and the kind of job breakdown used. Perhaps a combination of the two is best, using the whole method, but with sufficient flexibility to emphasize meaningful parts of the task wherever necessary.

Meaningfulness. Studies in verbal learning have demonstrated the importance of the meaningfulness of the material to be learned. Meaningfulness is important in safety education because the worker needs to understand why a certain procedure is better than another. Adequate explanation of a given movement or change in position, in terms of the hazards eliminated, with no decrease in production, gives meaningfulness to the procedure. With this understanding, the worker will be motivated to learn the safe procedure. Without it, he will be inclined to utilize his own method until he learns, perhaps by an accident, the inadequacy of it.

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The safety professional and line supervisor in safety programs should not forget the advantage of workers' understanding the reason for protective clothing, safety devices, safety meetings, and discussions, as well as the need for full and complete accident reports.

Meaningfulness to management and workers is understanding the value of a reduction of accidents, fewer disabilities, and retention of earning power.

Selective learning. Out of each day's many experiences, people select those which they desire to retain. This probably is related to motivation more than to anything else, and for that reason motivational aspects of a training program need to be considered. Safety trainers must be sure that the workers retain the most important facts. Relating subject matter to individual needs will ensure the proper selection.

Frequency. Everyone does best those things that he practices the most. This principle is certainly important to the safety professional for it emphasizes the necessity of frequent applications of safety rules and regulations in the training program. Frequent reference to the various kinds of problems, hazards, and procedures to eliminate accidents ensures greater effect than just a one-exposure routine. Giving the worker a copy of the safety rules and regulations in hopes that these will be learned and used is not enough. Means should be adopted which will bring them to his attention frequently and regularly.

A major railroad practiced this when its supervisors discussed with their employees a safety regulation each day before work began. Thus, each day, the staff was responsible for knowing, understanding, and applying this regulation, when appropriate or when asked by the supervisor. This company combined the principles of learning, reinforcement, and followup in one program activity.

A trainer must insist not only on frequent practice, but on the trainee's following the correct method. Day-after-day use of safe methods will create safe habit patterns that will later be followed almost automatically. The supervisor and safety director must make sure that the work method practiced is the safe one.

Recency. Closely allied to the principle of frequency is that of recency. That which is learned last can usually be most easily recalled. As has been indicated, handing a worker a set of safety rules and regulations does not ensure learning. Those who received printed instructions or a few training demonstrations a long time ago may not be able to recall now what the rules and regulations are. Safety professionals must devise means by which workers have constant contacts with these regulations through such continuing activities as contests, reviews of safety regulations, and committee work.

Primacy. The law of primacy must be taken into consideration in two aspects of the safety program. The worker's initial contact with procedures should be one of major importance. If this initial contact is of a negative nature—such as being tossed a book of rules, accompanied by a shouted, "Make sure you learn 'em"—the worker is left with the impression that safety is unimportant. From the very beginning of employment, the worker must get the impression that not only the rules but the whole program is of great importance. This will help assure the positive response desired.

Second, in the training program, habit patterns utilizing safe methods should assume primary importance. The supervisor must be certain that the worker does not have an opportunity to work by any other than the safe method. It becomes harder to establish good patterns after having first learned the poor ones. This principle applies to the golfer who has picked up bad techniques and then has to unlearn them as well as to the worker on the job. His training must be *right* from the very beginning. Old habits are hard to break and, to the safety professional, expensive in training costs and accident costs.

Intensity. Those things which are made most vivid to the worker will be retained the longest. Safety programs already utilize this principle in safety publicity with eye-catching posters and the like.

It is part of the safety professional's responsibility to enhance the worker's interest in the program. In this way, it will be a long-remembered experience. Under other conditions, it might well be forgotten minutes after it is over. To some degree, this is in effect positioning the safety program in the same way that advertisers position their commercials to catch the public's attention.

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Transfer of training. All new learning occurs within the context of previous learning experiences. The fact that current learning (or performance) can be influenced by previous learning is known as transfer of training. Positive transfer of training occurs when the previous learning facilitates the current learning or enhances current performance. Negative transfer of training occurs when the previous learning makes the current learning experience more difficult or in some way inhibits current performance.

Inasmuch as the safety professional desires to facilitate the learning of correct responses in new situations, he should attempt to maximize the positive transfer which occurs within the industrial environment.

Generally, learning to make identical responses to new stimuli results in positive transfer. For example, learning to drive in a new (or different) automobile is facilitated by the fact that identical responses (such as accelerating or steering) are required to the new stimuli (accelerator, steering wheel). If the new stimuli are very similar to previous cars (for example, the location of the controls, their texture, and their direction of movement), positive transfer should be high. In such situations, positive transfer increases as a function of increased similarity of the stimuli in the two situations.

Learning to make new responses to identical stimuli results in negative transfer. For example, if the controls of the cars appear identical but each car requires a different response in order to be operated correctly, negative transfer can be expected. After driving a car in which the "park" position appears on the extreme right of the indicator panel, much difficulty (negative transfer) can be anticipated when driving a car in which the "park" position appears on the extreme left of the indicator panel. Or, if the "off" position of one toggle switch is the same as the "on" position of another, the potential for accidents is serious.

Such negative transfer can take the form of errors, delayed reactions, and generally inefficient performance on the new task. In such situations the amount of negative transfer increases as a function of increases in the similarity of the stimuli in the two situations.

With an understanding of transfer phenomena, it is possible to maximize the opportunities for positive transfer and minimize those for negative transfer within the industrial environment. This requires careful planning of machine purchases and work procedures to make sure that the new tas[illegible]equired of a worker make use of (and do not conflict with) his previous learning experiences.

Forgetting

This discussion of learning would not be complete without some consideration of the process of forgetting, which goes on as learning takes place. Never assume that learning and forgetting are mutually exclusive, for such is not the case. As one learns, one also forgets what has been previously learned. Curves of forgetting indicate that most is lost immediately after learning has taken place. Depending on the complexity of the job, the amount of learning lost will vary after each day's training session. There should be less forgetfulness or initial mistakes in successive days of training, and more need for patient reteaching.

Consideration of the various principles of learning and the motivational aspects of the problem are essential if one is to retard this process of forgetting. The safety professional needs to consider all of them from the initial stages of employment right on through to the everyday work situations in the company.

Summary

The human factor operates at all levels in industry, and is perhaps the most potent factor for success or failure of a safety program. It makes a difference whether the president of a company approves or drags his feet, whether the safety professional works hard or coasts along, whether the supervisor emphasizes safety or subordinates it to production, whether the janitor cleans well or does only the minimum. Attitudes *are* important to safety in the company. Safety can be achieved only by working through all these people. The human factor must be dealt with in every area of industry.

To achieve some mark of success in dealing with people, individuals can best be considered within the framework established in this discussion. Each person is an individual, to some degree different from every other one. The differences are for the most part obvious, but there are subtle ones too, which must be recognized, if only to the extent that their existence is acknowledged.

Despite great differences in people, reasons for their activities are common to all. Many needs are the same, particularly at the biological level and to a large degree at the psychosocial level. It is

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upon these needs that the safety professional and others in positions of leadership in industry can capitalize to most effectively promote safety.

People become frustrated when their goals cannot be achieved. There are many ways of reacting to such frustrations, but the emotional reactions are of great concern to the safety professional. These reactions, as well as the attitudes formed during the reactions, can be highly disruptive to safety precautions and procedures.

Training programs are established to teach safe work methods. These learning situations, if they are to operate efficiently, call for knowledge of the basic principles of learning that cause people to learn and act as they do. These principles should be used to make new learning more efficient.

In no way is this chapter intended to minimize or ignore the work already being carried on to reduce accidents. Safety devices, safer machines, safe work layout, and many other aids and measures all are a part of the total program. The human factor is one more aspect of the whole system.

Workers, machines, and materials are still the three components of industry that can contribute to safety.

Machines and materials can be controlled, but the human factor must be guided in the interests of accident prevention.

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