

WARNING SOURCE

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ABSTRACT

This chapter describes the role and characteristics of the source in determining the effectiveness of communications to receivers. It begins by reviewing the various parties who may serve as a warning source and considers how a manufacturer should go about recognizing when warnings are necessary as well as how to go about disseminating effective warnings. A review is presented of research on the characteristics of a warning source that make it more effective. Inconsistencies in research findings are discussed and two relatively recent theories of persuasive communications are presented as a means of resolving these inconsistencies. The chapter concludes with recommendations for further research.

INTRODUCTION

The source is the party initiating communication where the intent is some combination of cognitive, affective, and behavior changes desired in the communication's recipient. In the communication-human information processing (C-HIP) model (see Wogalter, chap. 5, this volume; Wogalter, DeJoy, & Laughery, 1999), the source is the originator or initial transmitter of the warning and safety information. The source of product warnings can be family members, coworkers, government agencies, public interest groups, or manufacturers. The recipient is an individual deemed by the source to need the proper knowledge, attitudes, and behaviors necessary to ensure the safe use

of a product. The objective of this chapter is to offer a better understanding of how the effectiveness of warning and communications is influenced by the characteristics of the message source, particularly the manufacturer.

WHO IS THE WARNING SOURCE?

At first glance, it appears identifying the originator or initial transmitter of warning and safety information is rather simple and straightforward. However, it is neither because a variety of sources can provide warning information through several communication channels. To make this point more readily apparent, possible sources of warning and safety communications will be italicized in the following paragraphs of this section.

The most common source is the *manufacturer* who introduces a product into the stream of commerce. A manufacturer's warning may appear in written form on the product itself or in instruction manuals prepared by product designers or sales materials prepared by the marketing department. Warnings may also be transmitted orally through its manufacturer's *sales representatives* to the organizations who are the product's end-users. *Foremen or members of the safety staff* of the manufacturer's customers may be expected to convey the warnings orally in face-to-face conversations or in formal training programs to workers who actually use the product. If the manufacturer sells its products to other organizations through *wholesalers*, then these intermediaries may be responsible for conveying safety information. Other products may travel from manufacturer to wholesaler to *retailer* to consumer, and warning and safety

information is intended to travel with them in reaching the consumer. Safety information is appropriately provided by the *prescribing physician* and the *retail pharmacist* for pharmaceutical companies who also use on-product warnings, package inserts, and now extensive television advertising.

In the case of a manufacturer's advertising, the advertisement, including its copy or information content, is usually prepared by an *advertising agency*. These firms and the professional announcers they employ for the electronic media are typically transparent and, thus, are not viewed as an information source. However, if a spokesperson is a *celebrity*, or is presented as a *typical customer*, or *technical expert*, then these individuals may be viewed as information sources distinct from the advertiser.

Governments are a major source of product safety and warning information. In the United States, the federal government is most involved, but also state and local government may issue warnings. *Government agencies* disseminate warning information directly to the public; more often information is provided through news conferences and press releases to the news media. Additionally, what is said and how it is said in manufacturers' warnings is often determined by governmental agencies. In these cases, the government is the actual source of the message and the manufacturer's package provides the communication channel. The *U.S. Congress* initiated the transmission of warnings on alcoholic beverages by passing the Alcohol Beverage Labeling Act of 1988. Responsibility for the design and implementation of the warnings was assigned to the *Bureau of Alcohol Tobacco and Firearms*, and the *Surgeon General* is cited on the warning labels. *Courts* may also impose warnings on manufacturers.

Trade associations and standards organizations often play a role similar to that of the government by establishing specifications for product warnings. If an individual buys a new gas grill, he will find a number of warnings on it and in the accompanying instruction manual. Some of these warnings are designed by the *grill manufacturer*, but the large one found on the grill's 20 pound (9.1 kg) gas cylinder has been placed there by the *cylinder manufacturer*. The information content and design of this label is specified in a standard written by the *American National Standards Institute*. A *National Fire Protection Association* (NFPA) standard requires that a label be placed on these cylinders and identifies the ANSI label as an example of an acceptable one. The NFPA standard has been made a legal requirement by many *state legislatures*, so these labels are typically identical to the one found in the ANSI standard. An additional warning label on the cylinders was imposed by a California *court* as part of a class action suit.

Public interest groups may provide important warning and safety information through public service announcements, paid advertising, and press releases. *Universities* and other *research organizations* may also be sources of safety and warning information, sometimes through *the press* and sometimes by affecting other sources.

This discussion is important for four reasons. First, a wide variety of organizations provide safety and warning information to workers and consumers. Second, it is often the case that several organizations are involved in a single instance, and the

manufacturer may not have a free hand in the creation and distribution of warnings concerning its products. Third, it is often impossible to tell which organization or organizations were responsible for a particular warning. Fourth, these distinctions are important because the effectiveness of warning and safety communications are determined in part by attributions made about the message source by the message receiver, as will be demonstrated later in this chapter. Williams and Kalsher (chap. 49, this volume) describe a cascading effect of allocated responsibility when sources in the stream of commerce (manufacturer, distributor, owner) fail to pass along warning information to an injured party (see also Kalsher, Viale, & Williams, 2003).

THE MANUFACTURER AS THE WARNING SOURCE

Correctly or incorrectly, most message recipients probably assume the manufacturer is responsible for the content, design, and location of the warning and safety information on its products and the materials accompanying them. In the United States and in other countries, the *duty to warn* is a responsibility of any firm benefiting from a product's being placed in the stream of commerce, but the introduction of the product into that stream is at the discretion of its manufacturer. The failure of other parties to meet their duty to warn does not exculpate the manufacturer, but rather increases its obligations. For these reasons, this section examines the role of the manufacturer as the source of warning and safety information.

Hazard Analysis and Failure Analysis

Most workers and consumers in the United States probably assume products are safe if used properly. This assumption is founded on a tradition of concern for safety among manufacturers, the oversight of governmental agencies, and the tort-liability system utilizing the legal theories of implied warranty, negligence, and strict liability. If a product has no warnings, its users can assume it is free from hazards except those that are obvious and inherent in its proper use, such as the sharpness of a knife. Warnings, found on products if there is a hazard, are consequences or instructions to avoid the hazard that is not obvious to users. Additionally, a warning may be necessary if there is foreseeable misuse of a product that can result in property damage or personal injury.

Hazard Analysis. The manufacturer's efforts to identify potential product hazards are referred to as *hazard analysis*. Usually hazard analysis is performed before the product is released to market. However, additional hazards may be discovered in the marketplace long after a seemingly safe product has been introduced. The manufacturer's efforts to detect these hazards experienced in the marketplace is referred to as *failure analysis*.

Hazard analysis is the aspect of the new product development process involving the systematic identification, evaluation,

and resolution of potential hazards. Bahr (1997) discussed hazard analysis as a five-step process. First, the parts of the environment interacting with the product and each other must be identified and specified as a system. In addition to the product, this system includes the anticipated users, the anticipated usage environment, and other products or accessories that may be used with or near it. It is vital that a product initially developed in a design laboratory and used there by highly trained engineers be evaluated in hostile environments where it may be used by individuals of modest intelligence and no special knowledge or training.

Second, the perceived risk associated with each hazard must be ascertained where this risk is a function of the severity of the hazard and the likelihood of encountering it. Bahr cited a Department of Defense methodology defining four levels of *severity*: negligible, marginal, critical, and catastrophic. *Likelihood* of occurrence employs five levels: improbable, remote, occasional, probable, and frequent. The appropriate organizational *responses* to a hazard, as determined by the product's classification using these dimensions, are specified as: acceptable without review; acceptable with management review; undesirable—upper management decision to accept or reject risk; and unacceptable—stop operations and rectify immediately.

Fault tree analysis (FTA) and failure modes and effects analysis (FMEA) are two widely used quantitative safety engineering methodologies employed to identify and specify hazards. FTA uses a graphic representation of the system enabling engineers to identify combinations of conditions that could result in an undesirable outcome or fault. FMEA involves a systematic approach to identifying every way each product component can fail. FMEA is a tool developed to evaluate a product's reliability of operation and is not specifically a safety tool. This is because not all product malfunctions can cause harm and not all product hazards are associated with its malfunctioning. However, it is an appropriate safety tool in the many instances where a component's failure is dangerous as when the bracket attaching a seatbelt to the floor of an automobile breaks.

The third stage of hazard analysis is to implement corrective action and the fourth is to monitor the product. Implementing corrective action is discussed in the following section on the hazard control hierarchy. Monitoring the product is discussed now in the context of failure analysis.

Failure Analysis. "It is preferable to substitute hazards analysis (at the design stage) for failure analysis (after the product is in production and on the market). Engineering is always less costly than litigation" (Witherall 1985, p. 164). Such engineering can also save lives. Nevertheless, a hazard can be detected long after a product has been introduced into the marketplace. The Centers for Disease Control and Prevention (CDC) announced its first warning of the association between aspirin consumption by children and Reye's syndrome in 1980, although aspirin was introduced by Bayer in 1899.

The first key to failure analysis is early detection. A manufacturer's worst nightmare is to learn of a product hazard from a plaintiff's attorney representing someone's estate. Warranty programs and the use of toll-free numbers can be effective means

of early detection. There are also a number of early detection systems available for manufacturers such as:

- Consumer Product Safety Commission (CPSC) databases including the National Electronic Injury Surveillance System (NEISS).
- National Fire Incident Reporting System (NFIRS).
- CDC's *Morbidity and Mortality Monthly Review*.

The second key to failure analysis is a quick, preemptive reaction. Procter and Gamble's Rely tampon reached full national distribution in February of 1980 and the decision was made to withdraw the product the following September, despite scientific uncertainty about the actual cause of toxic shock syndrome (Cox, 1994). The danger is that an emerging problem lies buried in a vast database of warranty claims until outside events force the manufacturer to recognize what may be a crisis.

Hazard Control Hierarchy

Once a potential hazard has been identified while developing a new product, what to do about it becomes the issue. If the hazard is potentially catastrophic and nothing can be done to offset it, then the product should not be introduced into the market. However, if there are ways of addressing the hazard effectively, the classic hazard control hierarchy, or a variant of it, can provide direction to engineers and managers (Sanders & McCormick, 1993). This hierarchy offers a sequence of approaches to dealing with hazards that is ordered in preference. The basic sequence is first to design out the hazard, second to guard against it, and third to warn about it.

The first preference, eliminating the hazard through an alternative design, is generally best. If a poisonous ingredient can be removed from a product (e.g., lead from paint) and replaced with a safe, effective substitute, then the reformulation should be adopted. Alternatively, beveling a sharp edge on a piece of industrial equipment would eliminate a worker's risk of being cut. Unfortunately, not all hazards can be eliminated and still allow the product to function as intended.

The second line of defense is guarding—preventing contact between a product's hazard and its user. There are several forms of guarding. Personal protective equipment, road barricades, and locks on electrical boxes are examples of physical barriers. Designing a task to keep people away from a hazard is a procedural guard. The *dead-man* switch on a lawnmower that stops the rotating cutting blade when the handle is released and requiring a physician's prescription to buy drugs are other examples. However, guarding, like hazard elimination, is not always a feasible solution.

The third line of defense is to warn users about the potential hazard and to provide them with the information needed to make safe purchase and usage decisions. Parents can be warned not to give aspirin to children because of the risk of Reye's syndrome. Workers can be warned to ventilate the room properly when using a paint remover. Unfortunately, warnings are not as reliable as the two previous lines of defense. Depending on the

circumstances, the person at risk may not see or hear a warning, may not understand it, may not believe it, or may not be motivated to comply. For this reason, warnings are not a substitute for good design or guarding. Indeed, warnings should be viewed as a supplement, not a substitute, to the other safety approaches (Lehto & Salvendy, 1995).

The Occupational Safety and Health Administration (OSHA) imposes a legal responsibility on businesses for the safety of their employees, and businesses can utilize all three levels of the hazard control hierarchy. They can eliminate hazards in the workplace or never allow them to be introduced. They can use guarding by placing barriers to keep unauthorized individuals away from a hazardous area. They can warn employees directly through signs, alarms, and oral instructions from supervisors and safety officials. They may also use other methods of safety communication including: safety meetings, training programs, videos, printed materials, and computer-based instruction.

Implementing the Decision to Warn

If a manufacturer has determined that there is a potentially serious hazard that cannot be effectively controlled through redesign or guarding, then a warning is necessary. A warning is especially important if: the hazard is not open and obvious; the appearance of the product or its environment does not communicate a hazard's presence; or a reminder is needed to assure awareness of the hazard when the product is used. A number of important decisions must be made if a warnings program is to be effective. Among them are: who to warn, where to place the warning, and how to warn.

Who to Warn. The target of warning communications should be everyone who is at risk from a hazard and everyone else who may be able to reduce or eliminate that risk. Warnings often target very specific audiences. For example, warnings about TSS from the use of tampons would be directed to women of childbearing age. Other warnings, such as those providing information to individuals who might detect the smell of leaking gas, target the broadest of audiences.

Although warnings are usually directed at end-users, they may also be directed at intermediaries. Physicians reinforce and elaborate on warnings provided by pharmaceutical firms. Corporate safety officers incorporate warnings concerning specific products into their general training programs. Warnings on products for infants and children are written for parents and other adults.

The characteristics of intended warning recipients are obvious factors influencing the method and type of warning. Sophisticated recipients are able to read and understand technical or highly sophisticated language. For example, the side effects of a drug may be explained using technical medical vocabulary for physicians, whereas essentially the same information is explained to patients in simple terms as to its negative side effects. Likewise, a caustic product sold to consumers as a drain cleaner may have extensive and strongly worded warnings, whereas a product with the same compound that is only handled

by professional chemists may have little more than its name on the container.

When warnings target larger populations, as is the case with many consumer products, concern must be shown for the special needs of subpopulations. A general principle is that warnings should be written to take into account the lowest level of ability, training, and experience in the target population. Some individuals are color blind and thus unable to detect a color used to represent a particular level of severity of the hazard. Older adults may experience declining visual, auditory, and olfactory acuity. Stevens, Cain, and Weinstein (1987) found that 50 of 110 persons over the age of 60 were unable to detect odorized propane present at the safety threshold specified by the U.S. Department of Transportation. Additionally, there are many adults who are functionally illiterate or who do not know the English language. The increased emphasis on the use of symbols and pictographs has been in response to these problems and to the globalization of markets for many products.

Where to Place the Warning. There are two decisions concerning where to place the warning. The first concerns the communication channel employed. The senses of sight, sound, taste, and smell may be used to classify the various communication channels available—but with the recognition that some channels are multisensory. For example, the National Propane Gas Association (NPGA) publishes a safety brochure with a spot to be *scratched-and-sniffed* to enable the reader to experience the smell of propane. More information on channels will be given in chapter 9 of this handbook (Cohen, Cohen, Mendat, & Wogalter).

The second decision concerns where the warning is to be located relative to the product. Ideally, the warning should be attached directly to the product and remain there for the lifetime of the product. Unfortunately, there is no space available for this purpose on some products, and it is very limited for others. Accordingly, warnings are often placed in instruction manuals and safety guides. Some manufacturers now attach plastic envelopes to appliances so the manuals and guides can be kept at hand permanently.

How to Warn. The Federal Hazardous Substances Act administered by the U.S. Consumer Products Safety Commission (CPSC) regulates consumer products with hazards of a combustible, toxic, corrosive, or radioactive nature. Labeling on the package, outer wrapping, or container of these products must contain the following (Consumer Product Safety Commission, 2002):

1. Name and address of the manufacturer, packer, distributor, or seller.
2. Common, usual, or chemical name of each hazardous ingredient.
3. Signal word "Danger" for corrosive, extremely flammable, or highly toxic products.
4. Signal word "Caution" or "Warning" for all other hazardous products.
5. Statement of principal product hazard (e.g., "Flammable," "Harmful if Swallowed," etc.).

6. Precautionary statement telling users how to protect themselves from the hazard.
7. First aid instructions where appropriate.
8. The word "Poison" in addition to the word "Danger" for highly toxic products.
9. Special handling and storage instructions required to protect users.
10. The statement "Keep out of the reach of children."

Additionally, the label must be prominently located and conspicuous and legible in its graphic presentation.

These criteria can be distilled into a list of four general categories: signal word panel; hazard statement(s); statement(s) of consequences of improper use, and instructions on how to avoid the consequences and on proper use. This reduced set of criteria can be found in FMC Corporation's (1985) *Product Safety Sign and Label System* and American National Standards Institute ANSI (2002) Z535.4 that are applied to a wide range of consumer and industrial products.

JUDGING A WARNING BY ITS SOURCE

Reliance on the content of a message is to some extent conditional on an evaluation of its source. Aristotle observed this to be especially true when we know little about the topic. Extensive research has been done on these simple observations for more than 30 years. Lipstein and McGuire (1978) developed a bibliography of 7,000 articles on advertising effectiveness. They categorized the literature on source characteristics and found numerous articles investigating various characteristics of the source including credibility, likeability, and similarity of personal characteristics with the message recipient. Each of these topics is reviewed in the following.

Credibility

Credible sources enhance the believability of a given message (Hovland & Weiss, 1951). Highly credible sources have been found to produce greater attitude and behavioral change than less credible ones, to enhance fear appeals and to inhibit the formation of counterarguments (Mowen, 1995). According to Hovland, Janis, and Kelly (1953), credibility is based on perceptions of the perceived expertise and trustworthiness of the source. The demographics of the source and receiver has also been found to explain source credibility.

Expertise. Expert sources are assumed to have special knowledge acquired through experience, education, and training. Wilson and Sherrell (1993) conducted a meta-analysis examining 745 independent variables in 114 empirical studies and found that source effects accounted for 9% of the total variation in message effectiveness, and of that, 16% of that variation was due to manipulations of source expertise.

Mallet, Vaught and Brnich (1993) found that the miners who had previously survived a fire tended to trust another miner with

a good understanding of the mine more than the written sign or symbol found in the mine. Soumerai, Ross-Degnan and Kahn (1992) suggested beliefs about expertise were responsible for the quick spread of concern about Reye's syndrome by authoritative sources in the medical community despite more equivocal information being given concurrently in popular media sources.

Trustworthiness. Sources are viewed as trustworthy if their communication appears legitimate and there is no apparent conflict of interest. For example, to maintain its independence and trustworthiness, the magazine *Consumer Reports* accepts no advertising and tests products purchased through the same retailers used by consumers.

Craig and McCann (1978) found that a message sent to heavy users of electricity from an authority figure in the government, in this case the Chair of the New York State Public Service Commission, was more effective than the same message coming from the electrical utility, in this case the Manager of Consumer Affairs at Consolidated Edison. The letter from the government official yielded a decrease in electrical consumption (by approximately \$4.50) and an increase in requests for additional information (18% versus 10%). In contrast, an unknown person in a television commercial endorsing a product may not be perceived as credible to the critical viewer who appreciates that the endorser has been paid money by the manufacturer.

Locander and Hermann (1979) found that individuals were more likely to rely on independent sources of information (e.g., *Consumer Reports*, friends, and neighbors) than advocate-type sources (e.g., advertisements, point-of-purchase displays, and sales clerks) for high-hazard products (e.g., power tools) but not necessarily for low-hazard products (e.g., grocery store items). Other research on perceived trustworthiness and expertise in the context of warning messages is given later in this chapter.

Likeability

In general, the research literature indicates likeable and physically attractive sources are more successful at communicating the same message than less likeable and unattractive sources. Physically attractive people are perceived as more sensitive, warm, and happy than unattractive ones (Dion, Berscheid, & Walster, 1972). Chaiken (1979) found that not only were physically attractive persons more effective at communicating messages, but they also had measurable characteristics other than physical attractiveness that could enable them to communicate a message more effectively (e.g., higher grade point averages and SAT scores). The dimension of likeability helps to explain why some public figures are able to do extensive product endorsements, whereas others who are equally well known are not asked to do so.

Personal Characteristics of Source and Receiver

Research on the effects of the source's personal characteristics has focused primarily on the gender, age, and ethnicity of the

source and receiver. Rosen and Jerdee (1973) presented participants (undergraduates and bank supervisors) with a description of one of six supervisory problems and asked them to evaluate the effectiveness of the supervisory styles. In the descriptions, the gender of the supervisor and subordinates was varied. A threatening style was evaluated by participants to be the least effective and a helping style was evaluated as the most effective. However, the pattern of results also depended on the gender of the individuals described in the problems. A friendly-dependent style was perceived more effective when the gender of the supervisor and subordinate differed, and a reward style was evaluated as more effective for male supervisors than for female supervisors.

In general, research on source characteristics indicates receivers are more influenced by a source similar to them than one who is different. This effect has been found to be more powerful than perceived expertise. Greco and Eisenberg (1993) found that information from a peer group was more effective in changing behavior of physicians than nationally recognized experts. Brock (1965) found purchases made by retail paint customers were more influenced by sales clerks who were less knowledgeable but who had experience similar to the customers than sales clerks with much greater levels of knowledge.

INCONSISTENCIES IN SOURCE CREDIBILITY FINDINGS

Although researchers have established the existence of the relationship between source credibility and communication effectiveness, inconsistent findings have been found and the nature of that relationship has not been well understood until recently. McGuire (1969) cited research that found that receivers exposed to a high-credibility source experienced more attitude change than those exposed to a low-credibility source, but the two groups did not differ in their memory of the message content. Additionally, receivers exposed to a source with intermediate-credibility experienced an intermediate level of attitude change but remembered more of the message content than either the high- or low-credibility group. Conventional communication theory would have predicted that a source with higher credibility would have led to greater message comprehension, which, in turn, would have resulted in a greater attitude change. However, the intervening step of comprehension was not needed to change attitudes.

The relationship between source credibility and attitude change has also been found to interact with characteristics of the message. Mausner and Mausner (1955) and Sternthal, Phillips, and Dholakia (1978) found that a moderate-credibility source was more persuasive than a high-credibility source when the receivers were favorably disposed to the message. The less credible source may motivate receivers to acquire more supporting arguments to maintain their previous attitudes (Sternthal et al., 1978).

Research has also shown that attitude change may reflect an interaction between source credibility and receiver characteristics. Petty and Cacioppo (1986) suggested that high-credibility

sources are effective when the receiver's ability to process the message and/or his or her motivation is low, but source characteristics are relatively unimportant when ability and motivation to process the message are high. Haugvedt, Petty, and Cacioppo (1992) found that receivers who have a low need for cognition (i.e., not inclined to engage in deliberate analysis of a problem) are more likely to be influenced by source characteristics than receivers who have a high need for cognition (i.e., inclined to make deliberate decisions).

Social-Persuasion Models

Two models developed fairly recently have been used in recent years to help explain a broad array of research findings on attitude change. One is the elaboration likelihood model (ELM) and the other is the heuristic-systematic model (HSM). These two models will be discussed in turn.

Elaboration Likelihood Model. The ELM (Petty & Cacioppo, 1986) has been used to investigate the complex interactions among the elements of the conventional communication model. The ELM asserts that there is a central route of information processing where individuals actively gather and process information. There is also an alternative or peripheral route where individuals passively gather and process information. In other words, the central route involves high-involvement processing, whereas the peripheral route involves low-involvement processing.

According to the ELM, a message sent to an individual consists of a variety of pieces of information or cues. These cues include: the denotative (literal) meaning of the message; its connotative meaning (based on word choice as well as other accompanying sensory cues); characteristics of the source (described earlier in this chapter); and characteristics of the channel (described in the next chapter). Actively deliberated cues in high-involvement processing are called central cues, and these are mainly derived from the denotative meaning of the message. Cues that influence decisions in low-involvement processing are called peripheral cues, which are often based on source characteristics and the other factors listed earlier.

With these dual routes of information processing, the ELM is useful in resolving many of the inconsistencies found in previous research. In the laboratory, low-involvement and high-involvement are generally created by manipulating the relevance of the judgments that participants are about to make. Also typically manipulated are the source characteristics and message content. Ratings of agreement with the message content are used to measure the effects of the manipulations.

A typical ELM experiment might then manipulate the following: high and low involvement; strong and weak message arguments; and high and low source expertise. Frequently there are main effects for both source expertise and message strength, but the pattern for low- and high-involvement participants differ. For low-involvement participants, the perceived expertise of the source is more important than the quality of the argument, but for high-involvement participants the quality of the argument is more influential than source expertise. Petty and

Cacioppo (1986) noted that other source credibility characteristics (peripheral cues) have also been found to be influential with low-involvement processing.

Heuristic-Systematic Model. Chaiken (1980; Eagly & Chaiken, 1993; Rathneswar & Chaiken, 1991; Zuckerman & Chaiken, 1998) proposed an alternative approach, the heuristic-systematic model (HSM). In this model, systematic processing corresponds closely to central-route (high-involvement) processing. When systematic processing is involved, analysis of available data takes place and the experience is more effortful, requiring more cognitive resources. Heuristic processing is similar in purpose to the ELM's peripheral-route (low-involvement) processing, but the process is quite different. Heuristic processing involves selecting from a set of preexisting decision rules to make easy-to-process decisions (sometimes called *rules of thumb*) that reduce the cognitive workload. For example, heuristics include "experts can be trusted," "consensus implies correctness," and "a long argument implies a strong argument."

The ELM generally treats the two processes as alternatives, whereas HSM is usually conceived as the two processes working in parallel with heuristic processing attenuated in deliberative decisions. In a study evaluating written descriptions of a telephone answering system, Chaiken and Maheswaran (1994) concluded that source credibility influenced attitudes toward the product in several ways. Source credibility served as an heuristic for participants with low motivation. Also, highly motivated participants who read an ambiguous message were influenced by high-source credibility. Although source credibility directly influenced product judgments, it also influenced them indirectly by altering the extent to which the message was seriously considered.

An additional advantage of the HSM is that it provides a more complete understanding of low-involvement processing (Rathneswar & Chaiken, 1991, p. 53). Nevertheless, both the ELM and HSM models help explain the interactions among the effects of the basic elements of the traditional communication model by considering how individuals with differing levels of motivation and ability process the same message (see also Wilson & Sherrell, 1993). Unfortunately, the potential value of the ELM and the HSM models has not been examined systematically by warnings researchers.

WARNING COMPLIANCE IN A GROUP SETTING

Theoretical models of information processing, including the C-HIP model, employ the individual as the unit of analysis. However, communication is a social process, and it is rare that individuals react to warnings in social isolation. This section discusses when products are used in group settings where there may be several users and where nonusers can have a major stake in the outcome of the product usage.

The importance of group influence on individual behavior has long been recognized. Deutsch and Gerrard (1955) were the first researchers to distinguish between the information influence and normative influence of others on an individual's behavior. *Information influence* refers to changes in

our beliefs, attitudes, and behavior brought about by the content of communications. *Normative influence* refers to changes in our behavior, and ultimately even our beliefs and attitudes, by the ability of a group to reward and punish us. The classic research of Asch (1956) showed that individuals yielded to group pressure even when the group supported a clearly wrong decision.

Social power can be defined as the ability to influence others and French and Raven (1959) have defined six types: reward, coercive, legitimate, referent, expert, and informational power. Reward power and coercive power involve the use of power in its conventional sense, referring to the ability of group members to provide each other with positive and negative reinforcement. For example, caregivers' communications with their children are closely intertwined with the use of rewards and punishments. An employer can communicate safety information to employees who may realize they could be dismissed if they violate company safety policies.

Individuals are seen as having legitimate power if they have the right to prescribe behavior. For example, a grandparent can instruct a child to take their medicine even though no rewards or punishments are imminent. Alternatively, a worker may be more willing to listen to the advice of a foreman or shop steward than a fellow worker concerning the use of a metal press.

Referent power derives from the receiver's ability to identify with another person with that person serving as a model for attitudes and behavior. Chy-Dejoras (1992) found significantly more experimental participants wore gloves (87% compared with 50%) if they saw the film demonstrating their use in addition to being exposed to a warning on a container of adhesive remover. Additionally, more participants wore gloves (87% as opposed to 57%) when a model in the film wore gloves. Wogalter, Allison, and McKenna (1989) found that students were more likely to follow written chemistry laboratory instructions and wear a mask and gloves when a confederate wore them (100%) than when the confederate did not comply (33%). Clearly then, participants were using more information than just what the warning said in making compliance decisions (see also Edworthy & Dale, 2000; Racicot & Wogalter, 1995).

Group members are viewed as having expert power when they have special knowledge or training giving them special abilities to process information and make decisions. In a study by the CDC (1988) in Georgia, surveyors found that 90% of the adults surveyed were aware of influenza vaccine. Seventy-five percent of those who had received a recommendation from a health care provider received vaccinations, whereas only 7% of those who had not received such a recommendation received vaccinations. Even among those who had negative attitudes toward the vaccine, 70% received a vaccination if they had also received a recommendation from a health care provider. In addition to expert power, these remarkable results probably reflect the fact that the communications with health care providers involved face-to-face communication rather than a more impersonal communication channel.

Everett Rogers (1995) referred to group members with expert power as "opinion leaders," and suggested there is a two-stage process in communications. Thus, mass communications, for example, are first interpreted and then passed along by

opinion leaders to other members of the group, as opposed to going directly to these group members.

Information power is based on the fact that some individuals possess information not available to others even though they may not have any special expertise available to others. For example, a middle-age person may report to a group of friends that he or she heard on the news that taking certain pain relief medications may increase the risk of heart attacks.

The size and the extent of unanimity within a group appear to be directly related to its influence on individuals. However, minorities in a group can influence the decisions of a majority (Burnkrant & Cousineau, 1975; Moscovici, Lage, & Naffrechoux, 1969), suggesting that both information influence and normative influence are at work.

An individual's power may have multiple sources and every group member may have some degree of power. There may also be group conflict. In communicating safety information in a factory, a foreman may have significant normative influence (reward or coercive power) over a group of workers, whereas a safety trainer may have only information influence (information or expert power). However, the ability of coworkers to reward conformity to group norms and to punish deviation from them on a day-to-day basis may be much more important than both the foreman's and safety trainer's influence. Likewise, the behaviors of one's drinking buddies may be a much more important determinant of a person's behavior than a warning label on alcoholic beverage container labels.

RESEARCH ON THE WARNING SOURCE

Research showing the effects of source characteristics in health risk communications is extensive and well documented, showing effects across a wide range of product domains including food ingredient labeling and anti-smoking campaigns (e.g., see McGuire, 1980; Morris, Mazis, & Barofsky, 1980). Unfortunately, researchers and practitioners alike have largely neglected the possibility that source characteristics can enhance the effectiveness of product warnings. A review of the product warnings literature for this chapter uncovered a growing number of publications discussing source effects in warning communications across the last 2 decades (e.g., Beltramini, 1988; Cox, 1999; Driver, 1987; Laughery & Laux, 1988) but only four publications that actually studied source effects.

There are probably two reasons why source effects have not been extensively studied or utilized in the warnings area. One reason is that most warnings are written in the form of on-product warnings, instruction booklets, and signs. These are the most impersonal of communications. Most other communication media can better exploit the power of source characteristics, as, for example, with the medium of face-to-face communication where the full range of source characteristics can be employed. Source influences are more compatible to other media such as broadcast advertising.

A second reason why source effects have not been studied extensively in the warnings research is that product warnings rarely identify the source explicitly. In the United States there are a few notable exceptions with respect to cigarette and

alcohol, both of which refer to the "Surgeon General," with alcohol warnings also having: "Government warning." Consumers may assume that the source of warnings information on, or accompanying, a product almost always originates with the manufacturer, but that is not actually the case. In the United States, the federal government has mandated warnings on labels of certain products such as aspirin concerning Reye's syndrome and tampons concerning TSS, as well as many other government-mandated warnings appearing on such diverse products as pesticides, gas grills, and vehicles with air bags. The labels just do not say that the government is the source and required the warning.

Nevertheless, much of this chapter has suggested that source information may benefit the effectiveness of warnings. Indeed, early on, McGuire (1980, p. 105) stated that: "Even though the current nonattributional practice can be defended, the possibility remains that leaving most warning labels without explicit source attribution may be neglecting an input component which could add to the label's impact." At the same time, McGuire (1980, p. 104) also noted that warning information is probably perceived as credible even without explicitly stating the source because consumers recognize that manufacturers are pointing out serious limitations of their products by printing a warning. This last statement notwithstanding, explicitly stating the source of the warning might benefit its believability and persuasiveness. We now will review the results of studies that have explicitly manipulated source characteristics within warnings.

Lirtzman and Shuv-Ami (1986) employed three surveys to assess the trustworthiness of consumer test labs, university researchers, a federal agency, the product's manufacturer, and a labor union as a source of information concerning a dangerous or risky product. They found that the consumer test labs were the most trusted source. Unfortunately, they did not test whether trustworthiness translates into greater acceptance of the warning message.

Costello, Hellier, Edworthy, and Coulson (2002) examined the effects of source in the context of food labels communicating the presence of a genetically modified food. The attributed information source was "Consumer Association Notice," "Department of Health Notice," "Manufacturers Notice," or an unattributed "Notice." The results showed that the "Department of Health Notice" and the unattributed "Notice" sources resulted in higher levels of perceived hazard than the consumer association, with the other sources intermediate and not significant.

Guttman and Peleg (2002) described a study based on an initiative by Israel's Ministry of Health to investigate potential revisions to cigarette warning labels as part of larger anti-smoking efforts. A committee established by the Ministry to revise the warnings decided to survey public opinion to guide its decision regarding to whom warnings should be attributed and to counter opposition by the tobacco lobby. Two surveys were conducted: a face-to-face survey of 200 adult smokers and a limited phone survey of the adult population ($n = 1,000$). There were discrepancies for the light smoker's preferences between the two types of surveys, suggesting that the method of elicitation may have played a role. Nevertheless, the results generally showed little preference across participants for unattributed warnings. When presented with actual warnings, smokers tended to favor the attribution to "medical studies."

Nonsmokers were somewhat more likely to prefer an attribution to the Ministry of Health, giving reasons that the agency is "responsible for the topic" or "has the authority."

Wogalter, Kalsher, and Rashid (1999) reported two experiments in which source information was evaluated in the presence of warning messages for three types of products: alcohol, cigarettes, and iron supplement products. The warning messages are shown in the following:

- (a) Women should not drink alcoholic beverages during pregnancy because of the risk of birth defects. (b) Consumption of alcoholic beverages impairs your ability to drive a car or operate machinery, and may cause health problems.
- Cigarette smoke contains carbon monoxide. Smoking causes lung cancer, heart disease, emphysema, and may complicate pregnancy. Smoking by pregnant women may result in fetal injury, premature birth, and low birth weight. Quitting smoking now greatly reduces serious risks to your health.
- Keep away from children. Keep in original package until each use. Contains iron which can harm or cause death to a child. If a child accidentally swallows this product, call a doctor or poison control center.

The first experiment examined the effects of the presence versus absence of the signal word WARNING as a prefix to the beginning of warning messages on perceived credibility and likelihood to comply ratings. Also examined was whether the ratings would be affected by adding the word GOVERNMENT (i.e., GOVERNMENT WARNING) to the signal word, as well as adding more specific terms (i.e., U.S. and FEDERAL). The results showed that higher ratings were given when the signal word was present compared to absent, and were highest when the source named was longer and more specific. The second experiment in Wogalter, Kalsher, and Rashid (1999) investigated 12 signal word/source conditions based on three broad source categories for the same three product warning messages as the first experiment:

1. Specific regulatory governmental agencies (e.g., U.S. FOOD AND DRUG ADMINISTRATION).
2. Specific scientific professional groups (e.g., AMERICAN MEDICAL ASSOCIATION).
3. General statements in which an explicit source is not mentioned (e.g., Important Health Warning).

The specific source conditions and the credibility rating means (on a 0 to 8 scale, from low to high credibility) are shown in Table 8.1. The inclusion of specific sources produced higher credibility ratings (and willingness to comply ratings, which are not shown in the table) compared to no source alone. The other categories of source were intermediate.

The four studies presented here that have investigated the utility of source information in the context of warnings suggested that adding source information may be useful in increasing the effectiveness of warnings. Source information is likely to benefit warnings when the attribution is to specific, independent, and trustworthy organizations such as Consumers Union,

TABLE 8.1. Mean Ratings of Credibility as a Function of Product Warning Prefix

Prefix	Product Warning Message			
	Alcohol	Cigarette	Iron	Mean
—[blank]—	2.81	2.95	3.07	2.94
WARNING	3.51	4.00	4.09	3.87
U.S. SURGEON GENERAL'S WARNING	5.25	5.72	5.61	5.53
U.S. CONSUMER PRODUCT SAFETY COMMISSION WARNING	4.49	4.68	5.33	4.84
U.S. FOOD AND DRUG ADMINISTRATION WARNING	5.25	5.32	5.54	5.37
AMERICAN MEDICAL ASSOCIATION WARNING	5.53	5.56	5.46	5.51
AMERICAN PEDIATRIC ASSOCIATION WARNING	5.02	4.95	5.67	5.21
HEALTH WARNING	4.32	4.44	4.54	4.43
SAFETY AND HEALTH WARNING	4.54	4.56	4.89	4.67
U.S. PUBLIC HEALTH WARNING	4.75	4.75	4.68	4.73
MEDICAL HEALTH WARNING	4.74	5.00	4.82	4.85
IMPORTANT HEALTH WARNING	4.72	4.67	4.72	4.70
Mean	4.58	4.72	4.87	

publisher of *Consumers Reports*. Also attributed organizations such as a government agency or professional/scientific group, such as the U.S. Food and Drug Administration or the American Medical Association, are likely to benefit the message because of their perceived expertise. The primary benefit to warnings is that a trusted expert source is likely to make true statements and that can help in changing erroneous beliefs and attitudes that the receiver may have on the given topic of the warning message.

Clearly, the research on the topic of source effects in warnings is still in its infancy. Research is needed to explore the full potential of source effects in enhancing the effectiveness of warnings even if that potential may be limited. Given the importance of warnings and the potentially severe consequences of ineffectiveness, even small cumulative positive effects may be useful. Research is also needed to discover what inferences product users make when the warning source is not identified. Is an unattributed source for product warnings always connected with the product manufacturer? How does credibility compare when the warning is explicitly attributed to a product's manufacturer versus some other organization? Also of interest is how people would view trade associations as a source.

The tremendous growth in the Internet has revealed new ways to advertise products. The Internet has also produced fraud. The U.S. FDA treats pharmaceutical manufacturers' Web sites according to the rules of print/broadcast advertising. According to FDA regulations, manufacturers' advertising about

prescription drugs must give balanced risk and benefit information. This serves as a form of protection to consumers. However, risk and benefit information on drugs on other (nonmanufacturer) Web sites is not controlled by these regulations. Thus, in most cases, consumers must use cues to give them information about the credibility/trustworthiness of Web site information. Evil, Shaver, and Wogalter (2003) found that students and nonstudents gave higher trust ratings to the domain suffixes of .gov and .edu than to .org and .com domains. Evil et al. (2003) also found that several realistic, but bogus (fictitious) seals of approval/security were judged as trustworthy at levels as high or higher than some of the actual seals on reputable Internet sites. This means that Internet users may need to be more aware of the veracity of the attributed source in Internet transactions. An official-sounding, but fake, organization could provide biased presentation of benefit and risk information.

MULTIPLE WARNING SOURCES

As a practical matter, every individual communication must be viewed in the context of a history of communications on the same topic from a variety of personal and impersonal sources. It would be a serious mistake for warnings designers to ignore warning information reaching the target audience, especially when the messages are not all in agreement. Hence, an individual warning must be designed to compete for attention and comprehension with many rival sources of information. Additionally, the warnings designer should consider a mix of warning messages utilizing media that have a greater opportunity for capitalizing on source effects. It is not unusual for a gas utility company to use a mix of "bill stuffers," brochures, public service announcements, and oral communications from repair personnel to ensure the safe use of gas appliances.

Health risk warnings lend themselves to a multimedia approach. For example, Warner (1977) estimated that the anti-smoking campaign (the collective but uncoordinated activities of government agencies, private voluntary agencies, and for-profit firms) reduced per capita cigarette consumption by 20 to 30%. Soumerai et al. (1992) reported that the combined effects of medical journals, the U.S. FDA and the CDC, consumer advocacy organizations, and the Aspirin Foundation resulted in greater knowledge about, and the lowest incidence level of Reye's syndrome since its monitoring began in the mid-1970s.

SUMMARY AND CONCLUSIONS

The large body of communications research can give much insight into the processes of conveying warning information. The importance of the source is suggested in a large body of research on persuasive communications. Moreover, Wilson and Sherrell (1993) found that 9% of the total variation in message effectiveness was due to source effects, again suggesting that it is an area worthy of further exploration in the warnings domain. Recent research in the warnings literature seems to bear this out. That research suggests that the use of source aspects in warnings can benefit its perceived credibility. However, there is still a relative dearth of research on the topic.

Recent developments in information processing models have clarified how cues from source, message, and media are decoded in the process of receiving a message. Source characteristics appear to be more important when:

- Product users have a low need for cognition.
- Perceived hazard (hazardousness) is low.
- An individual is incapable of comprehending the warning because:
 1. The information is too complex or ambiguous.
 2. The language (symbols) are not understandable to the individual.
 3. There are time pressures or distractions.

Source characteristics appear to be less important when the:

- Product users have a high need for cognition.
- Perceived hazard is high because of unfamiliarity or high injury severity.
- An individual is capable of comprehending the warning information (i.e., does not have to rely on source heuristics).

Further warnings research on these and other source-related factors could contribute to knowledge about warning effectiveness. It is hoped that the rich tradition of communication research and recent theoretical developments will result in further empirical research, and that practitioners will be better able to produce warnings effective in minimizing personal injury and property damage.

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