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RICE UNIVERSITY

The Influence of Container Shape and Color Cues on Consumer Product Risk Perception
and Precautionary Intent

by

Elizabeth May Serig

A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

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ABSTRACT

The Influence of Container Shape and Color Cues on Consumer Product Risk Perception and Precautionary Intent

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Four experiments were carried out to examine the extent to which the container shape and color of a consumer product package influence hazard perceptions of that product. The experiments further examined the extent to which consumer product hazard perception influenced consumer precautionary intent. The first experiment demonstrated that participants could design product packages signaling the identity and potential hazard level of the contents. Experiments 2 and 3 validated the results of Experiment 1. Experiment 3 further introduced the concept of precautionary intent; participants were more likely to express precautionary intent for those products perceived as being more hazardous. Experiment 4 examined whether these stated intentions would be acted upon when participants were asked to actually interact with a product; it was found that participants were more likely to engage in precautionary behaviors than had been indicated in Experiment 3.

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INTRODUCTION AND OVERVIEW

Imagine driving on a busy interstate when you notice a fairly large rectangle metal container being bounced about the roadway in front of you by tractor trailer trucks. You see the container bounce into your lane, but you have no where to go; there are cars on either side of you. You collide with the container as it is bounced into your car's path and becomes wedged under the car in front of the driver's side tire. Carefully pulling over to the side of the road, you get out of the car to take a closer look. Upon closer inspection, the metal container looks badly damaged and you can see it leaking some liquid that smells like industrial solvent. You notice that the container once had a label, but it has corroded and worn away. It looks like you can pull the container out from under the front of your car. What should you do in a situation like this?

While the above scenario is not a common one, it and others like it do occur. Even more common are instances in which consumers are faced with relatively familiar consumer products whose hazards are not necessarily apparent. Overall, this paper is concerned with risk perception, specifically the awareness of and knowledge regarding consumer products and their hazards. The role awareness and knowledge play in risk perception is critical:

People may have information or experience in their overall knowledge base that at a given time is not part of what they are thinking about - awareness. In the context of safety or coping with hazards, it is not enough to say that people know something. Rather, it is important that people be aware of (thinking about) the relevant information at the critical time (Laughery & Wogalter, 1997, p. 1176).

The focus of the present research is to draw on the knowledge base members of the public have about common consumer products. How can consumers be warned that a particular product might be hazardous? What types of precautions do consumers take when using hazardous products such as cleaners, insecticides, and home improvement chemicals? The goal of this paper is to examine how people make hazard judgments of consumer products and how these judgments can be influenced through product packaging cues, as it is often the product package with which consumers first interact. A second goal is to see if these cues, by influencing hazard judgments, can influence consumers to take precautionary measures while using a product.

Risk Perception

Definitions of Hazard, Risk, Danger, and Risk Perception

When discussing certain situations and products, members of the public often refer to them as “risky,” “dangerous,” or “hazardous.” What do members of the public mean when they use these terms, and does what they mean differ from what safety professionals mean when they use these terms? Three terms form the basis of the risk perception literature: hazard, risk and danger. A *hazard* is a set of circumstances that can result in injury, illness, or property damage. The set of circumstances can include aspects of the environment, the equipment being used, the task being performed, and the knowledge, abilities, and limitations of the people involved (Christensen, 1987; Committee on Risk Perception and Communication, 1989; Laughery & Wogalter, 1997; Sanders & McCormick, 1993). The simplest definition of *risk* is the probability or likelihood of an undesirable event (i.e., injury, illness, or property damage) occurring

(Christensen, 1987; Lowrance, 1980; Sanders & McCormick, 1993). Risk quantifies hazard by attaching to it the probability of an adverse event occurring (Committee on Risk Perception and Communication, 1989). *Danger* is the product of hazard and risk (hazard x risk = danger). Accordingly, if either the hazard or the risk is zero, danger must also be zero (Christensen, 1987; Laughery & Wogalter, 1997; Sanders & McCormick, 1993). Despite the precision of these definitions, members of the public do not appear to conceptualize hazard, risk, and danger in the same way as do safety professionals. In fact, there is some evidence that members of the public use these terms somewhat interchangeably. Thus, when members of the public often refer to a situation or product as being “risky” or “dangerous,” they are most often responding to a situation or product being “hazardous” (Sanders & McCormick, 1993).

Risk perception, rather than being narrowly confined to the probability of undesirable events, appears to be a broad notion of safety awareness. Risk perception concerns both hazard and risk; it seems to involve an overall awareness and knowledge of the hazards, likelihoods, and potential outcomes of a situation (Laughery & Wogalter, 1997). Related to the concept of risk perception is risk assessment. Risk assessment is the professional practice of determining the scope and magnitude of hazards and determining whether or not society should be exposed to them. Risk assessment can be considered the process by which risk perception is formed. Rethans (1980) claims that risk assessment involves two interrelated aspects, a technical aspect and a social aspect. The technical aspect involves identifying hazards and measuring their probability of

occurring and the resulting consequences. The social aspect of risk assessment is the importance society attaches to identified hazards.

In characterizing the potential adverse effects of hazard exposure, several issues must be addressed. These issues include identifying the hazards associated with a particular situation or product, determining the probable exposure of people or things to the identified hazards, the distribution of exposure to the hazard, and the sensitivities of different populations (i.e., children versus adults) to each hazard (Committee on Risk Perception and Communication, 1989). It can be seen that these issues address Rethans' technical aspect of risk assessment. The "answers" to these issues serve as the foundation for the social aspect of risk assessment. Depending on what the hazards are, the likelihood of being exposed to the hazards, and who might be exposed to the hazards, society attaches differing degrees of importance to each hazard.

Measures of Risk

When dealing with measures of risk (in terms of risk assessment), there is a sharp distinction between objective and subjective measures of risk. Objective measures of risk are based on observations or calculations, employing experimental evidence, long-term experience, and sophisticated analytical calculations to describe actual risks or to project potential risks. These objective measures correspond to the technical aspect of risk assessment as described previously. In contrast, subjective measures of risk rely upon the perceptions of those assessing the risk; they reveal what members of the public think the hazards associated with a particular activity are.

These two measures of risk, the objective and the subjective, rarely agree. The objective measures of risk are those generated by safety professionals, while the subjective measures dominate the thinking and actions of most members of the public. It has been found that subjective measures of risk do not coincide with what is known about the actual hazards associated with certain activities or the expert projections of other hazards (Kasper, 1980). The fundamental difference between objective and subjective measures is best exemplified in the following quote:

why do I, as an individual road user, readily accept the risk of a particular journey under conditions of increased risk, such as alcohol consumption, frosted windows, bad lighting, etc., yet on the other hand, as a professional, regard these conditions as unacceptable?...I feel as rational as an individual road user, almost ignoring danger, as I feel when I am behaving as a professional safety researcher, stressing the point that some of these risks are not acceptable. (Oppe, 1988, p. 436)

Thus, Oppe argues that despite quantitative and objective evidence related to the hazards and risk of a certain situation, the subjective evaluation places different value on the same circumstances.

Dunn (1972) provides an empirical demonstration of the difference between objective and subjective measures of risk. The argument is that controlling risk-taking is more than establishing a code of acceptable and non-acceptable levels of risk. Rather, risk-taking must be controlled by attempting to induce accurate subjective risk estimates. If the objective and subjective measures agree, then the decisions made based on the

subjective model are “good” decisions. However, if the objective and subjective measures disagree, then the decisions made based on the subjective model will be “poor.”

Dunn questioned sawyers and had them estimate the frequency with which certain types of injuries occur on the job. These subjective estimates of risk involved in a particular situation were compared with objective measures of the same situation. A mismatch was found between the risks as perceived by the sawyers and the risks as objectively measured. This result can be explained by the fact that the sawyers’ experience with the different types of accidents would be quite limited. Their subjective model, then, would be based on little direct evidence and a great deal of informal group communication. Since accidents are rare, it is likely that one accident would drastically change the risk model, skewing it in favor of certain types of risks, and therefore leading to “poor” decisions.

Judgmental Biases in Risk Perception

Several factors can influence risk perception. When members of the public are faced with the difficult task of judging probability or frequency, they often employ a limited number of heuristics which reduce the judgments to a simpler task. Heuristics can be thought of as a “short-cut” to problem solving. Generally, some algorithmic process can be applied to a problem to yield an answer. An algorithm is a rule-based approach to problem solving; an answer will always be produced by following the algorithm in a step-by-step fashion. This process, however, is often time and resource consuming. Heuristics, on the other hand, take advantage of general “rules of thumb” which aid in decision making. Since these decisions are not based on an algorithmic

process, they are subject to a number of biases which affect judgments. Two biases which are thought to influence risk perception are the availability heuristic and overconfidence (Slovic, Fischhoff, & Lichtenstein, 1980).

Risk perception is thought to be partially based on the availability heuristic. Judgments based on the availability heuristic are those in which an individual estimates the relative size of a class, the likelihood of an event occurring, or the frequency of two or more events co-occurring. These judgments are made by assessing the ease with which the relevant cognitive operations of retrieval, construction, or association can be carried out (Tversky & Kahneman, 1973). Availability is brought to bear in situations where the frequency or probability of a class is assessed by the ease with which instances can be brought to mind. In general, availability is a particularly useful heuristic for assessing frequency or probability; instances of large classes are usually recalled faster and better than instances of less frequent classes (Tversky & Kahneman, 1982).

There are several biases, however, which seem to influence the validity of judgments based on the availability heuristic. Availability is generally an appropriate cue, as frequently occurring events are easier to imagine and recall than are rare events. However, several factors unrelated to the frequency of occurrence can influence judgments. In particular, recent disasters and media coverage can distort judgments. A study by Lichtenstein, Slovic, Fischhoff, Layman, and Combs (1978) examined how members of the public judge the frequency of death from various causes. While the participants demonstrated some competency in judging the relative frequency of various causes of death, their overall accuracy was quite poor. The judgments displayed a highly

consistent and systematically biased scale of frequency. In particular, causes of death with a relatively low frequency were overestimated, while those causes with a relatively high frequency were underestimated. This systematic bias was traced to a number of possible sources, one of which is disproportionate exposure to certain events. For example, deaths from commercial aviation accidents are often judged as being more frequent than deaths from automobile accidents. In general, there is more media coverage of commercial aviation accidents than automobile accidents, leading to a bias in the availability of instances to judge the frequency of each of the classes.

These findings were supported in further studies by Slovic, Fischhoff, and Lichtenstein (1980). Once again, participants were asked to judge the frequency of various causes of death. In one study, the participants were given the annual death rate for motor vehicle accidents in the United States and asked to estimate the likelihood of 40 other causes of death. In a second study, participants were asked to judge which of two causes of death was more frequent. The results of both studies revealed a consistent pattern. The participants were moderately accurate in a global sense; they were able to identify which lethal events were the most and least frequent. However, within this global picture, there were several serious misjudgments which the authors attributed to an availability bias. Once again, less frequent causes of death were overestimated and more frequent causes of death were underestimated. In particular, the overestimated items were dramatic and sensational, claiming several victims at a time, while the underestimated items were unspectacular, claiming one victim at a time. When judging the frequency of different causes of death, the availability heuristic reveals the vital role experience plays

as a determinant of perceived risk. Members of the public do not have a complete knowledge base regarding the likelihood of various causes of death. At best, they have knowledge of a subset of causes. This limited knowledge base provides a distorted view of the world of hazards. This distorted view is likely to lead to inaccurate perceptions of risk. This was seen earlier in the study by Dunn (1972), where the sawyers' model of risk perception was based on incomplete information from personal experience; where their experience and those of their peers formed the biased foundation of their judgment model.

Overconfidence in judgments is another bias which appears to influence risk perception. Members of the public are typically very confident in their judgments made based on heuristics and are quite insensitive to the tenuousness of the assumptions on which their judgments are based. In a follow-up study to the judged frequency of various causes of death, Slovic, Fischhoff, and Lichtenstein (1980) had participants indicate the odds that they were correct in choosing the more frequent of two lethal events. Participants often gave odds of 100:1 or greater that their judgments were correct. In reality, however, about 1 in 8 answers associated with such extreme confidence was incorrect.

Members of the public, however, are not the only group guilty of overconfidence; it affects the risk perceptions of safety professionals as well. Overconfidence in this case results in safety professionals overlooking or misjudging the paths that may lead to disaster. The presence of the overconfidence bias in these "expert" judgments may be a result of several factors, including a failure to consider the ways that human errors can

affect technological systems, possessing an overconfidence in current scientific knowledge, insensitivity to how technological systems function as a whole, failure to anticipate the human response to safety measures, and a failure to anticipate “common-mode” failures (Slovic, et al., 1980).

A subset of the overconfidence bias is the “It won’t happen to me” bias. In this case, members of the public tend to consider themselves personally immune to the many hazards whose societal risks they would readily acknowledge. This was seen earlier in the quote by Oppe (1988), where on an individual level, it was acceptable to drive under hazardous circumstances, but the same behavior became unacceptable at a societal level. Similarly, Rethans (1980) showed that people rate their own personal risk from each of several hazardous consumer products as lower than the risk to others in society. There appears to be two contributing factors to this overconfidence. The first factor is that hazardous activities and products for which personal risks are underestimated tend to be seen as under the individual’s control. Secondly, the hazards associated with these products tend to be familiar hazards whose risks are low enough that an individual’s personal experience is overwhelmingly benign.

Determinants of Perceived Risk

A theory of perceived risk should explain members of the public’s extreme aversion to some hazards, their indifference to others, and the discrepancies between these reactions by the public and safety professionals’ recommendations. Slovic, Fischhoff, and Lichtenstein (1980) questioned what determines whether members of the public view a particular technology as hazardous. In particular, they sought to determine

whether members of the public only refer to the number of people it could kill or to other, more qualitative features of the technology that influence the degree of risk it entails. In an attempt to quantify perceived risk, four groups of participants were asked to rate activities, substances and technologies according to the present risk of death from each. The four groups of participants were students, League of Women Voters (LOWV) members, business/professional club members, and risk experts. Each group of participants was asked to study the items and to think of all the possible ways someone might die in relation to an item. Participants were then to order the items from the least to most risky and assign a numerical risk value to each item. The results indicated many similarities between the judgments of the three groups of members of the public, but a marked difference in the judgments made by the risk experts.

What determines risk perception? What do members of the public mean when they say a particular technology is risk? The ratings of perceived risk provided by the participants were compared to the actual frequency of death associated with each item. The risk experts' judgments were closely related to the statistical or calculated frequencies; thus, it is assumed that the risk experts knew what the statistical estimates were and viewed the risk of an item as synonymous with the statistical estimates. The risk judgments of the members of the public, however, were only moderately related to the statistical frequencies of death. It appears then, that risk may not be synonymous with fatalities for members of the public.

In a further attempt to identify factors determining risk perception, the possibility that members of the public base risk judgments on subjective (and inaccurate) fatality

estimates was investigated. Students and LOWV members were asked to estimate the number of people who were likely to die in the United States as a consequence of a set of activities, substances, and technologies. If members of the public equate risk with fatalities, the estimates of annual fatalities, no matter how inaccurate, should be very similar to the judgments of risk for each item. However, it was found that there was only low to moderate agreement between the risk judgments and the fatality judgments. For example, nuclear power was perceived to have the highest risk associated with it, but the lowest fatality estimate. With nuclear power in particular, the discrepancy between high risk values and low fatality estimates may be attributed to disaster potential. While nuclear power is considered to have a low fatality rate in the average year, it is the potential of a catastrophic accident (claiming several lives at once) that appears to influence the high risk estimates.

Several qualitative factors also seem to influence risk perception. These factors include the situation's catastrophic potential, familiarity, understanding, personal controllability, voluntariness of exposure, dread, media attention, benefits, reversibility, and origins. In general, members of the public are more concerned with those situations where there is a high likelihood for catastrophe (fatalities are grouped in time and space), the situation is unfamiliar and not well understood, there is little personal control over the situation and exposure to the situation is involuntary. In addition, the effects of the catastrophe are dreaded, the situation has received much media attention, the benefits of the situation are unclear, the effects are irreversible, and the origin of the potential catastrophe is caused by human actions or failures. Taking the opposite of these

statements results in conditions where people are generally less concerned about the hazards posed by a situation (Christensen, 1987; Committee on Risk Perception and Communication, 1989; Rethans, 1980). Thus, many technologies fall into the former category; nuclear power is an example of a technology that is not well understood, receives a great deal of media attention, and has a high likelihood for catastrophe. Consumer products on the other hand, are often quite familiar, receive little media attention, are under direct control of the user, and are unlikely to result in catastrophic accidents. Thus, these qualitative factors may make some consumer products appear less hazardous than they really are.

Consumer Product Risk Perception

Introduction

When dealing with consumer products, the concept of “open and obvious” is key when thinking about risk perception. “Open and obvious” is based on the idea that the appearance of a situation or product or the manner in which it functions should communicate the nature of attendant hazards (Laughery & Wogalter, 1997). For example, the hazards associated with a chainsaw are relatively obvious when compared to a chemical product such as bleach. Related to the concept of “open and obvious” is the “everybody knows” problem. In the “everybody knows” problem, designers create products. These products generally have hazards associated with their use; the safe use of these products requires some knowledge or information about these hazards on the part of the users. It is quite often the case that the intended users do not have this requisite knowledge. The design process frequently includes little or no attention to knowledge

requirements of users, and where they are addressed, inappropriate assumptions are often made as to what people know or what they will do in certain situations. In other words, “everybody knows” what the hazards associated with a product are. However, the designers seldom assess whether or not these assumptions are valid (Laughery, 1993).

Laughery (1993) cites several reasons why members of the public “do not know” about the hazards inherent in consumer products. In some cases, the hazard is hidden, thereby violating the concept of open and obvious. When dealing with new technology, particularly new chemical technology in the form of pesticides, herbicides, insecticides, cleaning agents, and solvents, the ingestion, inhalation, and skin contact hazards may not be known. In other cases, the product presents misleading information, indicating that it is safe, when in fact, it is not. Another reason why members of the public “do not know” is that accidents are relatively rare events. Members of the public are frequently exposed to accident statistics, however, actually experiencing an accident accompanied by an injury is a rare event. The fact that accidents are so rare provides little opportunity for members of the public to learn about the causes of accidents and therefore attend to safety issues. Finally, poor mental models can lead to not knowing about the hazards associated with consumer products. If an individual’s model of the product is inappropriate or incorrect, the hazards inherent in the product may fail to be perceived and understood. This was described earlier in Dunn (1972), where the sawyers appeared to have inappropriate models of risk and therefore incorrectly estimated certain hazards and risks.

When dealing with consumer product risk perception, safety professionals must deal with the subjective models held by individuals about products. One of the issues

confronting safety professionals is how consumers view hazard, risk, and danger. As stated earlier, these terms have very specific definitions in the safety literature. However, there is a difference in the way that safety professionals and members of the public use these terms. Specifically, there is confusion over the term “risk.” Objectively, risk is the statistical likelihood or probability of an undesirable event occurring. Subjective risk, on the other hand, is generally viewed as “danger” or “threat.” Safety professionals use the objective definition, expressing risk as a likelihood or probability. Members of the public, however, use the term risk as a synonym for the magnitude of hazard and danger.

Young, Brelsford, and Wogalter, (1990) found that members of the public do not readily distinguish between hazard, risk, and danger. Participants in a study were asked to assess a product. Risk perception and distinctions between “hazard,” “risk,” and “danger” were probed by using different key words in a questionnaire: some participants evaluated the product for “hazard,” others for “risk,” others for “danger,” and finally, others for “hazardous-to-use.” These concepts appeared to be interpreted similarly, and the authors combined the concepts into a composite score indicating the “overall unsafeness” of a product. Thus, it was found that members of the public interpret risk differently than safety professionals. The term “risk,” therefore, may not be an effective way to communicate the probability and likelihood of undesirable events occurring. An issue of even greater interest was that the participants generally did not see the relevance of attending to adverse outcome probabilities when dealing with consumer products. These probabilities are often expressed in very small numbers, and therefore do not seem to evoke much concern. As most individual’s experiences with consumer products is

overwhelmingly benign, the likelihood of an undesirable event occurring at any given instance of use is not generally considered.

Several issues look to be related to consumer product risk perception and risk assessment (Wogalter, Brems, & Martin, 1993). The first issue is whether or not people can accurately assess the relative risk of consumer products. Risk in this case is defined as objective injury data for particular products and accuracy is determined by comparing risk estimates to the objective injury data. Another issue is whether people's risk assessments can be improved when they are given additional time to consider potential accidents. The rationale behind this issue is that responses made very quickly are likely to be based on readily accessible intuitive knowledge, while those decisions that involve lengthy consideration are likely to be based on analytical strategies. Finally, does accident scenario analysis improve risk perception accuracy? In other words, does deliberately invoking analytical strategies result in more accurate judgments than intuitive judgments?

It has been reported that members of the public are fairly good at estimating the relative risk involved in using various products; they can identify Product A as being more hazardous than Product B but less hazardous than Product C. Beyond this relative ranking, however, members of the public are poor at estimating the actual frequency of injury associated with various products; products with relatively low accident frequencies are overestimated while products with relatively high accident frequencies are underestimated (Sanders & McCormick, 1993). This finding is related to the use of the availability heuristic in forming risk perceptions as described earlier.

A model of risk perception has been proposed to determine the relative roles of an intuitive knowledge base and analytical strategies to assess and react to risks. Brems (1986) proposed that this model is based on the notion of “intuitive judgment” in risk assessment. Brems uses the availability heuristic as the foundation of this model. The model proposes that there are a number of unlikely, but possible, hazards encountered during the course of a normal life. Knowledge about such hazards is likely to be intuitive, rather than analytical, in the sense that such knowledge is readily accessible without conscious or lengthy consideration. However, as noted earlier in the section on the availability heuristic, such relatively effortless judgments are prone to biases.

Brems had participants complete several tasks to determine a value of risk perception for several consumer products to test the proposed model. Participants were asked to estimate injuries for various consumer product categories. These estimates were to be made at a fast pace, a slow pace, after recalling accident scenarios, and after building fault trees for assessing risk. It was hypothesized that the estimates made at a fast pace would be based on intuition, while those made after building fault trees would most likely be based on analytical strategies. These analytical estimates should be more accurate than the intuitive estimates, revealing systematic errors in the intuitive knowledge base. It was found, however, that the frequency estimates made at a fast pace were just as accurate as those based on more analytical strategies.

Similar results were obtained by Wogalter, Brems, and Martin (1993). Participants in this study were able to quickly estimate the risks associated with common consumer products, and these estimates corresponded reasonably well with objective

frequencies of product-related injuries. Consistent with the availability bias, products with lower objective risk frequencies were overestimated, while products with higher objective risk frequencies were underestimated. Participants were also asked to generate accident scenarios for the various products and then make injury frequency estimates. There appeared to be no effect of time or cognitive analysis on risk assessment accuracy, however. Estimates made quickly were as accurate as those made after more time or after generating accident scenarios.

These two studies seem to indicate that accident scenarios do not play a role in common consumer product risk assessment. The quick estimates of risk were just as accurate as those made after the lengthy construction and analysis of accident scenarios. Also, when asked to make fast or unhurried judgments, both judgments were made in very short periods of time (seconds). Thus, it seems that few, if any, scenarios are spontaneously generated to aid in judgment during the unhurried condition.

If frequency estimates are not based on analysis of accident scenarios, on what are they based? Wogalter, Brems, and Martin (1993) provide a likely explanation. They propose that members of the public gain general knowledge of the relative risks of various consumer products through experience and that this information is retrievable with little or no analytical thought. Each product may have a mental tag, a summary of what an individual knows about a particular product and its associated index of risk. There is some evidence that an individual may briefly consider one general accident scenario. This is supported by the finding that risk perception is strongly predicted by the severity of the first scenario recalled. The mental processes used to evaluate common

risk by members of the public are different from the analytical procedures used by safety professionals in technological risk assessment. While safety professionals strive for objective, analytical, step-by-step strategies to assess risk, risk perception by members of the public appears to be accomplished in a more holistic, intuitive manner.

Determinants of Perceived Risk for Common Consumer Products

Several results have been consistently found regarding how consumers form perceptions of product hazardousness. Several factors appear to influence perceptions of product hazardousness. These factors include whether or not the product has the capability to inflict severe injuries or death as an immediate consequence, the likelihood of being injured while using a product, and the consumer's familiarity with and knowledge of the product. Given a certain level of perceived hazard, consumers also seem to have several beliefs and expectations related to the appearance of product warnings. In particular, consumers believe that products perceived as more hazardous have a greater need for warnings than those products perceived as less hazardous. Not only do consumers expect more hazardous products to have warnings, but they expect these warnings to be located in close physical proximity to the product, and these warnings detract less from the appearance of more hazardous products (Wogalter, Desaulniers, & Brelsford, 1986; Wogalter, Brelsford, Desaulniers, & Laughery, 1991).

The severity of injury resulting from product use has been found to be the single best predictor of consumer product hazard perceptions. Previous research has shown that people often misperceive the number of deaths associated with a variety of consumer products. In particular, they overestimate infrequent causes and underestimate frequent

causes of death. There are two possible sources of information which may influence the formation of consumer product hazard perceptions: the severity of injury and the likelihood of being injured while using the product. Two experiments conducted by Wogalter, Desaulniers, and Brelsford (1987) point to severity of injury as playing the largest role in consumer product risk perception. These findings were later replicated by Wogalter, Brelsford, Desaulniers, and Laughery (1991). In the first experiment by Wogalter, Desaulniers, and Brelsford, participants were asked to rate 72 generic product names regarding hazard, injury severity, injury likelihood, and familiarity with the product. The single best predictor of hazard ratings in this experiment was the expected severity of injury. Combining the expected severity of injury with the likelihood of injury added little predictive power beyond severity of injury alone. In their second study, participants were asked to generate specific accident scenarios for each of the 72 products and to rate each scenario with regard to the expected severity and probability of injury. Once again, severity of injury was the primary determinant of consumer product hazardousness. More importantly, for high hazard products, the first scenario generated had a higher severe injury rating than subsequent scenarios. The first scenarios were also the most likely, which is in accord with the availability heuristic (where events that are more easily recalled are judged as occurring more frequently). This also relates to the idea of the “mental tag” discussed earlier. It is likely that consumers base their hazard perceptions on these first scenarios, where the expected severity of injury plays the largest role. An important point regarding the relation between accident scenarios and risk perception is that perceptions of hazard may be influenced and potentially biased by any

factor that determines what scenario comes to mind first. Biases and inaccuracies in hazard judgments will occur if the most readily imaginable scenario is not representative of how severely an individual could be injured.

While the likelihood of injury does not seem to influence risk perception much beyond the expected severity of injury, there are some instances where it has been found to influence risk perception. Desaulniers (1989) found that accident likelihood is considered for the most severe accidents. Participants were asked to rank order products on six dimensions: perceived hazardousness, the likelihood of causing a minor accident, the likelihood of causing a major/severe accident, the extent to which the likelihood of accidents are controllable, the extent to which the severity of accidents involving products is controllable, and the frequency with which participants used products. The judgments of likelihood for a major/severe accident were highly correlated with rankings of product hazardousness.

Similar results were found in a study by Young, Wogalter, and Brelsford (1992). While severity of injury was still the best single predictor of risk perceptions, those products with the highest hazard ratings were distinguished by their likelihood ratings. One possible explanation provided by the authors is that when rating items which are on the whole extremely hazardous (very likely to result in severe injury and very unfamiliar), the likelihood of injury becomes the important variable in forming risk perceptions. In most cases, severity of injury is sufficient in forming perceptions of risk, and involves greater use of heuristic processing than would processing likelihood information. When the severity of the potential consequences reaches a certain level (i.e., very severe injury

or death), however, the only remaining uncertainty about the outcome is the likelihood of that event occurring.

Familiarity is also a factor which influences risk perception of common consumer products. Several studies have shown that familiarity with a product is significantly and negatively related to hazard ratings of consumer products (Desaulniers, 1989; Wogalter, Brelsford, Desaulniers, & Laughery, 1991; Wogalter, Desaulniers, & Brelsford, 1987). Those products which were less frequently used and therefore less familiar to consumers were perceived as more hazardous than products which were used frequently. Not only does increased product familiarity reduce the perceived hazard associated with a particular product, but it also has been found in some cases to reduce the perceived hazard of products similar to it. In a study of tampon use and toxic shock syndrome (TSS), it was found that women may change to a more absorbent, and therefore more hazardous, brand without checking for warnings because they are already familiar with tampons in general. Godfrey and Laughery (1984) found that

Subjects were more likely to notice a warning the first time that they used this product than they were when they switched to a similar product. This finding implies that being familiar with the product or a similar product led to their perceiving the hazard as lower than they would have otherwise thereby causing them not to notice warnings. (p. 485)

While product familiarity has been found to be significantly related to consumer risk perception, it appears to have little predictive power of hazard ratings beyond the expected severity of injury.

Product Cues Influencing Risk Perception

Given that severity of injury appears to be the primary predictor of risk perception for common consumer products, there are several ways in which these perceptions can be manipulated. Color and shape are both cues which have been shown to influence risk perception. Color has long played a role in the risk perception literature. Color has been found to influence the saliency and recall of warnings, compliance behavior, and the level of conveyed hazard. Labels printed in color are perceived as significantly more salient (attention-getting) than black-and-white labels (Braun, Kline, & Silver, 1995; Kline, Braun, Peterson, & Silver, 1993). Orange highlighted print was better recalled on a warning than non-highlighted print (Young & Wogalter, 1990), and higher compliance levels was found for color warning signs over black-and-white signs (Wogalter, Godfrey, Fontenelle, Desaulniers, Rothstein, & Laughery, 1987).

Research has also demonstrated that there is a consistent population color stereotype for risk perception. That is, certain colors consistently connote a certain degree of hazard. In many cases, these colors are paired with a signal word such as DANGER, WARNING, or CAUTION. Several industry standards have paired red, orange, and yellow with DANGER, WARNING, and CAUTION respectively. Bresnahan and Bryk (1975) found a consistent color ranking for accident prevention signs printed in different colors. Red signs received the highest hazard association ratings, followed by yellow, green, and blue (as cited in Braun, Kline, & Silver, 1995; Braun & Silver, 1995).

The consistency of color meanings has also been shown across language groups. Dunlap, Granda, and Kustas (1986, as cited in Braun & Silver, 1995; Chapanis, 1994)

conducted a study with International Business Machines (IBM) employees from the United States, Canada, and Belgium. The participants rated signal words and color names on the degree of personal hazard believed to be implied or associated with each item. The signal words and color names were rated separately. It was found that the signal word DANGER consistently evoked the highest degree of hazard, followed by WARNING, CAUTION, and BEWARE. There was no significant difference between these three words. These signal words were followed by ATTENTION, NOTICE, and THINK. The colors were consistently rated with red connoting the highest degree of hazard, followed by orange, yellow, blue, green, and white.

These findings were replicated in pilot studies by Meingast and Serig (1998) and Serig (1998b). In both of these studies, participants were asked to rank order a series of colors, illustrated as color-printed blocks on a page, according to the level of hazard they felt that each color conveyed. In the first study, colors were ranked in the following order, from greatest amount of hazard to least amount of hazard: red, orange, bright orange, yellow, bright yellow, black, blue, purple, green, bright blue, and white. In the subsequent study, the colors bright orange, bright yellow, and bright blue were removed and the color gray was added. In this study, participants were divided into two groups. One group ranked the colors as described above while the second group assigned a numerical rating value to each color. The rankings and ratings were significantly correlated. The colors were ranked as follows: red, orange, yellow, black, green, blue, gray, purple, and white. While there appeared to be some “muddiness” in the middle, the anchors remained consistent: red, orange, yellow, and white.

Color, when used in warnings, essentially serves as a redundant coding dimension that augments the communication of hazard. This redundancy often takes the form of a signal word such as DANGER printed in a color such as red. As noted above, the color red consistently connotes the greatest amount of hazard. The predominance of red in connoting hazard holds when combined with a signal word. Chapanis (1994) examined the interaction of color and signal word by combining signal words with a background color. Three signal words, DANGER, WARNING, and CAUTION, and four colors, white, yellow, orange, and red, were studied. When ranking signal words, DANGER connoted more hazard than WARNING and CAUTION. The colors were ranked red, orange, yellow, and white. The differences among the colors and signal words were highly significant. When the interaction between signal word and color was examined, however, the only significant finding was the dominance of red over any other colors. For example, a red CAUTION was rated as connoting more hazard than a yellow DANGER.

A study by Braun and Silver (1995) expands on the findings of Chapanis (1994). Color was applied to consumer product warning labels, where it was hypothesized that product warnings printed in colors connoting greater hazard would produce greater warning compliance than product warnings printed in colors found to connote less hazard. Consistent with previous research, a trend for greater warning compliance was found favoring warnings printed in red. It was also hypothesized that the same hazard signal word can be perceived as indicating a different hazard level when printed in a different color. Thus, a red DANGER would be perceived as more hazardous than a

black DANGER. Given five colors and 21 signal words, the findings were consistent with earlier studies. The colors were independently ranked as follows (from high hazard to low hazard): red, orange, black/green/blue; there were no significant differences between black, green, and blue. The signal words were consistently ranked so that words connoting high hazard were judged more hazardous than words connoting moderate hazard, which were judged as more hazardous than words connoting low hazard. The interaction of color and signal word seemed to indicate that words printed in red connoted significantly more hazard than any other color.

Edworthy and Warren (1996+) found similar results with literate children. The authors created 18 warning cards, made from a combination of one of three signal words (DANGER, CAREFUL, and WARNING) and one of six background colors (red, orange, yellow, blue, green, and white). The cards also contained instructions below the hazard word. The children were asked to select which card was the most important to obey, the next most important, and so on. The effects of signal word and color were significant overall. DANGER was consistently ranked as being more important to obey than WARNING and CAREFUL. The set of colors was anchored with red and white; red was consistently judged as the most important to obey, while white was consistently judged to be the least important to obey.

With respect to consumer products, another dimension that can be manipulated to influence consumers' perceptions of hazardousness is shape. Riley, Cochran, and Ballard (1982) determined a hierarchy of user preferences for shapes to be used on warning labels. The shapes were taken from common traffic control signs. The shapes were

shown in pairs and participants were asked to give an opinion about which shape of each pair they preferred as a warning indicator. Given shape alone, an equilateral triangle on its point was judged to connote the greatest degree of hazard. In general, it was found that shapes which appear unstable (balanced on a point, rather than a side) were preferred as warnings.

While Riley, et al (1982) examined the role of shape on warnings, the shape or configuration of the container itself can be used to draw attention to a label that denotes the hazards associated with a product. In a study by Wogalter, Laughery, and Barfield (1997), participants evaluated a set of containers (presented as black-and-white line drawings) that hold chemical products. Participants made consistent ratings for perceived hazard of each of these containers. Certain containers were consistently judged as connoting a high hazard, while others consistently connoted low hazard (Wogalter, Laughery, & Barfield, 1997). Specifically, those containers which appear to contain household cleaners and other home/garden products (i.e., bleach, paint, insect spray) were judged as connoting more hazard than containers which appear to hold liquid food products (i.e., milk, soda, wine).

Given the independent evidence that color and shape may serve as cues that can manipulate consumers' perceptions of product hazard, how do color and shape interact? Rodriguez (1991) systematically assessed the influence of color and shape on participant compliance, retention of label details, and perceptions of product hazard. Red, green, and black-and-white labels were contrasted in each of the following shapes: octagonal, triangular, and no shape (open border). The color red consistently produced the highest

ratings of hazard, while the combination of the color red and the octagon shape produced the highest level of retention of label details. While earlier results by Riley, Cochran, and Ballard (1982) pointed to the dominance of an equilateral triangle on its point for connoting hazard, it may be that the combination of the color red with an octagon shape instantiated a “stop sign” model in the participants, thereby making it the combination of color and shape which appeared to connote the most hazard.

A study focused on preventing childhood poisoning was conducted with preliterate children to see which containers the children found most attractive (Schneider, 1977). The children were presented with geometrically round, triangular, and square containers. The containers were painted red, white, or black. Schneider measured the attraction a child showed to each container. Children were attracted to square containers over round and triangular containers. Children were also most attracted to white containers, followed by black, with the least amount of attraction for red containers. Thus, it seems that even with preliterate children their behavior may be consistent with a “warning stereotype;” the children were least likely to investigate the red containers.

Precautionary Behavior

Introduction

Precautionary behavior is often used as a direct measure of risk perception. Precautionary behavior in consumer product risk perception research is generally assessed in terms of whether participants take some particular action (reading a label, putting on protective equipment) when using a particular product (DeJoy, 1989). Rather than being asked to actually take some action, participants are often asked whether they intend to

take a particular action (read a label or put on protective equipment). These statements of intent are often equated to the actual performance of precautionary behavior.

Martin and Wogalter (1989) propose that precautionary intent is strongly related to the perception of hazards in common consumer products. Their research found that precautionary intent was most strongly correlated with perceptions of severe injury, as well as being negatively correlated with the frequency of product use. When participants were presented with a list of common consumer products, products rated as having a high accident frequency were used significantly less often than products rated as having a moderate accident frequency. Frequency of use has been found to be related to familiarity, thus it appears that the products in the moderate accident frequency category are more familiar than those in the high accident frequency category. Lower hazard perceptions were associated with more familiar products. Thus, the results indicated that the greater the hazard perception (based on high accident frequencies) the more likely it was that precautionary intent was expressed.

While it was previously discussed that studies have shown that allowing for longer processing times does not necessarily influence risk perception, longer processing times appear to have an effect on precautionary behavior. When participants are given additional processing time, precautionary intent ratings are influenced. Participants who spend the least amount of time making estimates give lower ratings of precautionary intent than those who spend more time making estimates. The severity of possible injury also seems to be a strong predictor of precautionary intent. The expectation of how badly

an individual can get hurt while using a product determines how much precaution the individual intends to exercise (Wogalter, Brems, & Martin, 1993).

What determines whether members of the public will protect themselves against the severe losses that might arise from some rare hazard? Empirical evidence has already suggested that members of the public are more likely to engage in precautionary behavior when they perceive a high expected severity of injury. It has been suggested by Slovic (1980) that probability also plays a role; members of the public are more likely to insure against higher-probability, low-loss hazards rather than lower-probability, high-loss hazards. Members of the public prefer to protect themselves against those hazards that are relatively likely to happen. Seatbelt use has often been viewed from this perspective. An overall benign experience with driving automobiles may eventually lead to a habit of neglecting seatbelts; on any single given automobile trip, there is an extremely low probability of an accident occurring. This makes it unlikely that members of the public will voluntarily engage in a precautionary behavior (using their seatbelts). However, if the perspective is changed from that of an accident occurring on a single automobile trip to the likelihood of an accident over a longer period of time, the probability of an accident occurring may become high enough to induce precautionary behavior.

Predicting Behavior

Much of the safety literature seems to equate the intent to exercise caution with actually performing precautionary behaviors. The basis of this argument lies in the research of Ajzen and Fishbein (1980). They contend that intention is the immediate determinant of behavior. When an appropriate measure of intention is obtained, it will

provide the most accurate prediction of behavior. In safety research, participants often make a choice regarding whether or not they will engage in any of a number of precautionary behaviors. When the participant expresses this choice, he is essentially saying that he is more likely to perform one of the alternatives than any of the others. Once this choice has been expressed, it is expected that the participant will in fact perform the alternative indicated.

Ajzen and Fishbein propose that in order to predict a behavioral criterion from an intention, it is essential to insure that the measure of intention corresponds to the measure of behavior. An intention consists of an action, the target, a context, and a time element. These same elements are also present in the performing of the actual behavior. For example, there could be an intention to buy flowers at Heart's Florist for Valentine's Day on February 12. In this case, the action is buying, the target is flowers, the context is Valentine's Day, and the time element is a specific date. An intention and a behavior correspond to the extent that their elements are identical. A measure of the likelihood that a person will engage in a given behavior is called behavioral intention.

A measure of intention may not always be a good predictor of behavior. Intentions can change over time, and a measure of intention taken some time prior to the observation of behavior may differ from intention at the time the behavior is observed. The longer the time interval between assessing intention and measuring behavior, the greater the likelihood that events will occur producing changes in intention. While intentions are assumed to be the immediate antecedents of actions, the observed relation between intention and behavior depends on two factors. First, the measure of intention

must correspond to the behavioral criterion in action, target, context, and time. Second, the measure of intention will only predict behavior if the intention does not change before the behavior is observed.

Reading Labels as a Precautionary Measure

The consumer product risk perception literature considers reading a label one form of precautionary behavior. In many cases, however, it has been found that the information conveyed by warnings may fail to reach consumers. Three reasons have been suggested why this may occur: the consumer may not see the warning, the consumer might not understand the warning, and finally, the consumer may ignore the warning even when it is visible and comprehensible. A study by Wogalter, Desaulniers, and Brelsford (1986) examined whether perceptions of hazardousness and familiarity relate to a willingness to read warnings. They found that the primary determinant of the likelihood that warnings will be read is the product's perceived level of hazard. More hazardous products tended to be seen as less familiar than less hazardous products. Thus, warnings were also more likely to be read on less familiar products. The authors proposed that one of the reasons why members of the public may fail to read warnings is because they misjudge the hazardousness of the product. These findings were replicated by Wogalter, Brelsford, Desaulniers, and Laughery (1991).

Cost of Compliance

The cost of compliance in taking precautionary measures also appears to influence the degree to which they are taken. DeJoy (1989) proposes that precautionary measures are more likely to be taken when compliance costs are low. In other words, warnings that

do not require much time or trouble for compliance will be more effective than warnings that require more time and trouble for compliance. In a field study where a warning sign indicating an alternative exit was located on a broken door, the cost of compliance was manipulated on three levels (Wogalter, Godfrey, Fontenelle, Desaulniers, Rothstein, & Laughery, 1987). Cost was determined by the distance potential users of the broken door had to travel to an alternative exit. The high cost alternative received no compliance, the moderate cost alternative received 5% compliance, while the low cost alternative received 94% compliance by individuals trying to use the broken door. Thus, even if a warning is salient, informative, and concise, it may not necessarily be effective. People may see a warning, read it, and yet, not comply with it. The cost of compliance, which affects motivation, must be considered. The less time and effort required for compliance to a warning, the greater impact it will have on behavior.

Rodriguez (1991) studied the effects of cost of compliance. Participants were given the apparatus for a simple chemistry experiment. Chemicals were placed in plastic bottles; the target stimulus bottle had an identifying tag covering part of the warning text printed on the bottle. The warning label recommended the use of eye protection, gloves, and an apron. The label varied in color and shape. The colors were red, green, or black-and-white. The shape was either an octagon, triangle, or no shape (open border). The protective equipment recommended by the warning label was available, but with differing costs of compliance for each item. It was hypothesized that compliance would be highest for those participants presented with red colored warning labels and for those participants presented with octagonal and triangular shaped labels. It was also hypothesized that the

level of compliance would decrease as the amount of effort necessary to obtain the safety equipment increased.

The level of compliance was manipulated by making it necessary to expend more effort to retrieve each item (eye protection, gloves, and apron). The eye protection was available on the table with the chemistry experiment apparatus (low cost), the gloves were located across the room (moderate cost), and the participant had to ask the experimenter for the apron (high cost). It was found that color and shape influenced compliance. A directional trend was found in favor of the color red, and any shape was better than no shape. As expected, the level of compliance decreased significantly as the amount of effort necessary to obtain the safety equipment increased. Participants with the highest compliance scores also scored significantly higher on a questionnaire probing retention of the label details: “those who actually read what the warning said and took precautions, were attending to the physical characteristics of the label at a higher rate than those participants that did not read the label at all” (Rodriguez, 1991, p. 1033).

EXPERIMENTS

The actual knowledge used when interacting with a product can come from many sources in addition to (or instead of) the product manufacturer's printed information. This includes the knowledge instantiated from the physical features of the product, the user's experience with similar products, and usage information from others, including employers, co-workers, family members and acquaintances. Members of the public often may be "overloaded" by the information on products. The product manufacturer's information may include information on the operation of the product as well as information related to the purchase, installation, assembly, maintenance, inspection, and disposal of the product. Providing this broad and detailed information may overload consumers; in some cases it may result in consumers selectively attending to the information, potentially filtering out what may be truly critical information. One response to such user overload is to limit the amount of printed information communicated. One way of limiting the amount of printed information is to instantiate the desired usage behavior through physical design features of the product (Rhoades, Frantz, & Miller, 1990). For example, most product container designs reveal how the contents should be dispensed.

Wogalter, Laughery, and Barfield (1997) point out that pre-existing schemas and scripts about products in certain kinds of containers could lead to false assumptions about the product and how to safely transport, store, and use it. For example, if a manufacturer fills a container with a more dangerous chemical than members of the public expect it to contain, consumers may not employ adequate precaution when using the product.

Consumer perceptions, whether correct or incorrect, are likely to be based on previous experience with known products in a similar container. Wogalter, Laughery, and Barfield found that, in general, containers connoting low hazard look like containers of liquid food products, while containers connoting high hazard resemble TNT detonators and gravestones.

Two previous studies by Serig (1998a, 1998b) assessed the relative contributions of hazard cues in risk perception of common consumer products. For both studies, a policy-capturing method was employed to examine the role of container shape, color, and packaging material on consumers' perceptions of product hazard. The intent of the policy-capturing method is to determine the relative importance of each of the cues in influencing decisions. For these experiments, the variables differed on three levels, representing low, moderate, and high hazard. The three cues (shape, color, and packaging material) were combined orthogonally with the three levels of hazard to create 27 unique container combinations.

In the first study (Serig, 1998a), participants were divided into two groups. One group answered the question "Would you keep the contents of this container out of the reach of children?" The other group responded to the question "Would you look for a warning on this product container?" These questions were designed to probe the underlying risk perception of each product container. None of the three cues appeared to significantly influence perceptions of risk in this study.

In the second study (Serig, 1998b), risk perception was probed in more depth. Participants responded to several questions regarding the hazards associated with each

product container. It was found that as the participants perceived the contents of a container as more hazardous, they were more likely to read a label on the container. It was also found that the three cues of container shape, color, and packaging material contributed significantly to predictions of product hazardousness. Thus, as each of these cues was perceived as connoting more hazard, the judgments regarding the product hazards were likely to be higher. The second preliminary experiment appeared to demonstrate that the cues of container shape, color, and packaging material influence consumer risk perception.

The current research had two primary objectives. The first objective was to explore whether the physical properties of a consumer product package influence perceptions of hazardousness of the contents. Related to this issue is the experience members of the public have with consumer products being packaged in a variety of shapes, colors, materials and sizes. Therefore, a related aim was to address the issue of whether members of the public share a common set of experiences that product packages contain certain products. The second objective was to explore how perceived hazardousness of a consumer product relates to intentions to engage in precautionary behavior as well as to actual precautionary behavior. Further, the relation between intended and actual precautionary behavior was addressed.

Experiment 1

Introduction

This experiment investigated whether participants used stereotypes when asked to design a product package that signaled both the type of contents and the relative hazardousness of the contents. In other words, it examined whether participants were more likely to select certain container shapes and colors for specific types of products and for different levels of hazard. This and subsequent experiments were limited to household products that are likely to have hazards associated with them and to require certain types of precautionary behavior. Food products and health products were not used, as there are relatively few inherent hazards associated with these classes of products when compared to other categories of household products.

According to Rhoades, Frantz, and Miller (1990), members of the public often appear to apply knowledge when using a product that does not come from the accompanying documentation. Rather, they have pre-existing scripts and schemas regarding the hazards and use of particular products. This pre-existing knowledge comes from experience with products being consistently packaged in certain types of containers and experience with certain colors indicating varying levels of relative hazardousness. The intent of Experiment 1 was to explore this pre-existing knowledge by investigating whether members of the public have and make use of a common set of experiences related to consumer product packaging.

Method

Participants

Thirty students from Rice University participated in Experiment 1 and received psychology course credit for their participation. There were 8 males and 22 females; the mean age of the participants was 19.5 years old, with a range of 18 - 23 years.

Participation was limited to those who had normal color vision.

Materials

Scenarios. The experiment used 15 scenarios consisting of a written description of a new consumer product. A 5 x 3 design was used to create the scenarios; there were 5 different product types and 3 levels of hazard for each product type. Thus, each of the 15 scenarios was a distinct combination of a particular product type and hazard level. The five household products were selected to represent a range of different types of products with relative differences in their defined hazards. The five product types were: household surface cleaner, furniture refinisher, automotive treatment (i.e., motor oil, gasoline treatment, brake fluid, etc.), concentrated garden pesticide, and wall-treatment/adhesive (i.e., spackle or wall-paper adhesive). Three hazard levels were defined: extremely hazardous (high hazard condition), moderately hazardous (moderate hazard condition), and slightly hazardous (low hazard condition). These hazard levels were operationalized by the potential severity of injury resulting from an accident when using the product. Extremely hazardous items were associated with death or a major injury requiring emergency room treatment and long-term/permanent disability, moderately hazardous items were associated with a major injury requiring emergency room treatment and a

short-term disability, while slightly hazardous items were associated with no injury or a minor injury remedied by first aid (Desaulniers, 1989; Wogalter, Desaulniers, & Brelsford, 1987). The order of the 15 scenarios was randomized for each participant. The scenarios are presented in Appendix A-1.

Container shapes and colors. Participants received a set of container shapes printed on an 8 ½ x 11 inch sheet of paper. The order of the shapes on the page was randomized for each participant. The shapes were chosen to represent a wide variety of common container shapes in the marketplace and were selected by searching through weekly advertisements. The shapes were presented as black-and-white laser-printed line figures. Figure 1 presents the shapes used. Participants also had access to a set of colors, presented as “squares” color laser-printed on an 8 ½ x 11 inch sheet of paper with the name of the color printed next to the “color square.” Figure 2 presents the colors used. The order of the colors was also randomized for each participant. See Appendix A-2 for examples of the container shape and color sets as presented to the participants.

Product packaging response sheet. Participants assigned a hazard rating to the product in each scenario and indicated their container shape and color choices on a response sheet. The response sheet is shown in Appendix A-3.

Procedure

The scenarios framed the experiment in terms of a design task where the participants were asked to assume that they worked for an industrial manufacturer. They were to assume that they had been given the job of designing a container for a new

Figure 1. Container shape set used in Experiment 1.

Figure 2. Color set used in Experiment 1.

product developed by the company. This container had to convey information to potential consumers, particularly what the enclosed product might be and its potential hazardousness. Participants were asked to read each scenario, and then rate the described product for its potential hazardousness to the consumer. This measure of perceived hazard was rated on a 9-point scale, where the anchors were (0) slightly hazardous, (4) moderately hazardous, and (8) extremely hazardous. Participants then chose a container shape and color for the product from the provided container and shape sets. These responses were recorded on the response sheet. Participants were told that they may (and were, in fact, encouraged) to use shape and color combinations more than once if they deemed it necessary.

Results

Hazard Analyses

A 5 x 3 ANOVA was performed to assess the influence of product type (5 product types) and hazard level (3 hazard levels) on perceptions of product hazardousness. Participants were given a 9-point scale ranging from slightly hazardous (0) to extremely hazardous (8) and asked to indicate their perception of the potential hazardousness of the product described in each scenario. The means and standard deviations for each product type and hazard level are presented in Table 1. Results from the ANOVA indicated that the product type, hazard level, and interaction of product type and hazard level influenced perceptions of product hazardousness. The results from the ANOVA were: for product type, $F(4, 430) = 13.519, p < .0005$; for hazard level, $F(2, 430) = 340.409, p < .0005$; and for the interaction of product type and hazard level, $F(8, 430) = 2.273, p < .022$.

Comparisons using Tukey's HSD revealed significant differences between several pairs of the product types and between each pair of the levels of hazard. The ANOVA results, Tukey HSD and the means and standard deviations for each product type and level of hazard are presented in Appendix E-1.

Table 1

Mean Hazard Ratings and Standard Deviations for each Product Type and Hazard Level:
Experiment 1

Product	Hazard Level	Mean Hazard Rating	Std. Dev.
Household Surface Cleaner	Low	2.933	1.388
	Moderate	4.862	1.381
	High	6.266	1.201
	Total	4.685	1.904
Furniture Refinisher	Low	3.862	1.301
	Moderate	6.100	1.446
	High	7.655	.552
	Total	5.875	1.940
Automotive Treatment	Low	3.700	1.149
	Moderate	4.966	1.496
	High	7.300	1.149
	Total	5.322	1.959
Concentrated Garden Pesticide	Low	2.933	.980
	Moderate	4.533	1.479
	High	1.137	1.125
	Total	4.842	2.110
Wall-Treatment/Adhesive	Low	2.758	1.272
	Moderate	4.300	1.622
	High	7.166	1.234
	Total	4.764	2.291
Total	Low	3.234	1.290
	Moderate	4.953	1.595
	High	7.101	2.085

A measure of interrater reliability was used to assess the degree of agreement between the participants on the hazard ratings for each scenario. Measures of interrater reliability measure intraclass correlation, where the proportion of systematic variance in a set of judgments is assessed in relation to the total variance in judgments. Table 2 contains the measure of interrater reliability for each of the 15 scenarios. These measures indicate a relatively high rate of agreement on the hazard ratings.

Table 2

Interrater Reliability of Hazard Ratings for Stimulus Scenarios: Experiment 1

Scenario	Mean	Minimum	Maximum	Std. Dev.	Interrater Reliability
1	2.933	0	6	1.38	0.711
2	4.86	2	7	1.38	0.893
3	6.26	3	8	1.20	0.783
4	3.86	1	6	1.30	0.745
5	6.10	3	8	1.44	0.686
6	7.65	6	8	0.55	0.954
7	3.70	1	6	1.15	0.801
8	4.96	2	8	1.49	0.663
9	7.30	3	8	1.15	0.801
10	2.93	1	5	0.98	0.852
11	4.53	1	7	1.48	0.671
12	7.13	4	8	1.12	0.810
13	2.75	0	5	1.27	0.757
14	4.30	1	7	1.62	0.605
15	7.16	3	8	1.23	0.771

Container Shape and Color Selection

One of the general questions being explored in Experiment 1 was whether the selection of a container shape or color for the products described in the scenarios would differ from a random assignment of container shapes and colors. More specifically, this experiment explored whether container shape and color selection were influenced by the

product type and hazard level defined in the scenarios. Chi-square analysis was performed to determine if there was a container shape and color chosen significantly more often than the other container shapes and colors across all scenarios. The overall chi-square for container shape selection across all scenarios was $\chi^2 = 446.022$, $p < .01$. The overall chi-square for color selection across all scenarios was $\chi^2 = 329.29$, $p < .01$.

Cohen's kappa was used to assess the degree of agreement between the participants for the container shapes and colors selected overall across scenarios. Kappa measures interjudge agreement and is used to examine the reliability of ratings; it examines the agreement between raters on the assignment of objects to categories. This measure essentially addresses the question of whether a group of raters agree with each other about the category membership of an object. Kappa can range from 0 to 1, where with complete agreement among the raters $\underline{K} = 1$, and where there is no agreement among the raters $\underline{K} = 0$. For the container shapes selected, $\underline{K} = 0.1039$, $\underline{z} = 16.007$, $p < .00003$. For the colors selected, $\underline{K} = 0.1707$, $\underline{z} = 27.527$, $p < .00003$. In both cases, the judgments made by the participants appear to be due to differences in the scenarios, and not chance.

As the overall chi-squares for container shape selection and color selection across all scenarios were significant, other questions can be investigated regarding container shape and color selection. A series of chi-square analyses were carried out to assess whether the defined product type influenced container shape and color selection, and whether the defined hazard level influenced container shape and color selection. The first two chi-squares investigated whether a container shape and color were chosen significantly more often than the other container shapes and colors for each defined

product type. A 5 x 10 contingency table of product type by container shape resulted in $\chi^2 = 313.786$, $p < .01$. A 5 x 7 contingency table of product type by color resulted in $\chi^2 = 142.09$, $p < .01$. The remaining two chi-squares investigated whether a container shape and color were chosen significantly more often than the other container shapes and colors for each defined hazard level. A 3 x 10 contingency table of hazard level by container shape resulted in $\chi^2 = 49.52$, $p < .01$. A 3 x 7 contingency table of hazard level by color resulted in $\chi^2 = 122.879$, $p < .01$.

Another purpose of the experiment was to determine whether a particular container shape and a particular color were selected significantly more often than chance for each of the stimulus scenarios. As the chi-squares for overall container selection and color selection across all scenarios were significant, chi-square analysis was performed on the individual scenarios to determine whether a container shape and color were selected significantly more often than the other container shapes and colors for each scenario. Table 3 contains the chi-square values for both container shape selection and color selection for each of the 15 scenarios. Significant values, indicating a container shape or color selection differing significantly from chance, are printed in bold type. Appendix E-2 contains bar graphs displaying the distribution of container shape and color selection across the five defined product types. Each bar graph represents the selection distribution for one product and its three defined hazard levels.

Table 3

Chi-Square Analysis of Scenarios for Container Shape and Color: Experiment 1

Product	Hazard Level	Variable	χ^2	df	Asymp. Sig.
Household Surface Cleaner	Low	Container	17.133	6	0.009
		Color	6.40	5	.269
	Moderate	Container	21.276	5	.001
		Color	15.483	5	.008
	High	Container	5.20	5	.392
		Color	8.00	5	.156
Furniture Refinisher	Low	Container	15.00	8	.059
		Color	7.333	6	.291
	Moderate	Container	41.40	8	.000
		Color	17.20	5	.004
	High	Container	17.60	6	.007
		Color	18.00	5	.003
Automotive Treatment	Low	Container	23.20	6	.001
		Color	8.267	6	.219
	Moderate	Container	20.40	6	.002
		Color	12.933	6	.044
	High	Container	26.933	6	.000
		Color	19.667	4	.001
Concentrated Garden Pesticide	Low	Container	12.133	7	.096
		Color	49.20	5	.000
	Moderate	Container	48.60	8	.000
		Color	18.533	6	.005
	High	Container	31.333	7	.000
		Color	7.00	4	.136
Wall-Treatment/Adhesive	Low	Container	28.80	6	.000
		Color	30.40	5	.000
	Moderate	Container	48.00	8	.000
		Color	7.8	6	.253
	High	Container	16.00	5	.007
		Color	16.667	6	.011

Discussion

As asserted by Rhoades, Frantz, and Miller (1990), knowledge is often applied in consumer product use that does not come from the accompanying documentation. One of the underlying assumptions in this experiment was that the participants had a common foundation of experience with consumer products. A part of this common experience may include knowledge regarding the types of containers in which various products are packaged. The results of this experiment indicate that both the product category and hazard level (as defined by potential consequences) identified in the stimulus scenarios were influential in the selection of container shapes and colors for the product packages. Thus, the results of this experiment are seem to be consistent with the assumption that the participants had a common foundation of experience with consumer products that influenced container shape and color selection. Table 4 identifies the scenarios with significant chi-square values, and the most frequently selected container shape and/or color for these scenarios. The product packages developed in these scenarios were used to create the stimuli for Experiment 2 and Experiment 3.

Container shapes and colors appeared to be selected for the individual scenario product packages according to some criterion. The chi-square analyses revealed that both the defined product type and defined hazard level influenced container shape and color selection.

Color selection for the product packages appeared to be influenced by the defined levels of hazard. In general, the color red was associated with moderate to high hazard scenarios, while the color white was generally associated with low hazard scenarios. This

pattern is consistent with the discussion of color and hazard presented in the Introduction and Overview. An unexpected result was that the color black was also associated with high hazard scenarios. Previous research on color and hazard has often placed black “somewhere in the middle” on a range of colors indicating varying degrees of hazard (Braun & Silver, 1995; Chapanis, 1994; Serig, 1998b).

One explanation for this finding is that in some instances, color may have been associated with a product based not on its potential hazardousness, but rather with the type of product. For instance, the color green was consistently associated with concentrated garden pesticide. This association can be explained by the common experience consumers have with “outdoor and garden” products being sold in green product packages. Similar pre-existing associations with the product type based on experience may have influenced selection of the color black for particular products in this experiment.

Table 4

Container Shapes and Colors for Scenarios with Significant Chi-Squares: Experiment 1

Scenario	Product	Hazard	Container	Color	Experiment
1	Household Surface Cleaner	Low		-	2
2	Household Surface Cleaner	Moderate		Yellow	3

5	Furniture Refinisher	Moderate		Red	2, 3
6	Furniture Refinisher	High		Red	3
7	Automotive Treatment	Low		-	2
8	Automotive Treatment	Moderate		Red	3
9	Automotive Treatment	High		Black	3
10	Concentrated Garden Pesticide	Low	-	Green	-
11	Concentrated Garden Pesticide	Moderate		Green	3
12	Concentrated Garden Pesticide	High		-	2
13	Wall-Treatment/Adhesive	Low		White	3

14	Wall-Treatment/Adhesive	Moderate		-	2
15	Wall-Treatment/Adhesive	High		Black	3

Note. The cells in the Container column that contain a dash (-) indicate that there was no container shape selected significantly more often than the other shapes for this scenario. The cells in the Color column that contain a dash (-) indicate that there was no color selected significantly more often than the other colors for this scenario.

Experiment 2

Introduction

The purpose of Experiment 2 was to explore the relation between container shape and the product(s) that should be contained in a shape. Experiment 2 employed an approach to the product and container shape question different from Experiment 1. The intent was to determine whether a set of common experiences with consumer products influenced container shape selection in Experiment 1. This experiment tested whether participants were able to name the likely contents of a container given only an outline of its shape. The container shapes used in this experiment were those determined from the chi-square analysis of each of the 15 scenarios in Experiment 1. The analysis of the 15 scenarios in Experiment 1 resulted in five dominant container shapes when collapsed across the five product types. In other words, when the data were collapsed across product type, one container shape was consistently associated with each product type. The container shapes found significant for each scenario were presented in Table 4. The significant container shape for each product type were as follows: for household surface

cleaner, Shape G; for furniture refinisher, Shape I; for automotive treatment; Shape C; for concentrated garden pesticide, Shape J; and for wall-treatment/adhesive, Shape D.

Method

Participants

Thirty students from Rice University participated in Experiment 2 and received psychology course credit for their participation. There were 13 males and 17 females; the mean age of participants was 19.3 years old, with a range of 18 - 23 years. Participation was limited to those who had normal color vision and had not participated in Experiment 1.

Materials

Stimuli. Each of the container shapes was laser-printed on an individual 8 ½ by 11 inch sheet of paper. Figure 3 presents the container shapes for Experiment 2. The order of the container shapes was randomized for each participant. See Appendix B-1 for the container shape stimuli as presented to the participants in Experiment 2.

Product packaging response sheet. Participants recorded the most likely contents of each container on a response sheet; a sample response sheet can be found in Appendix B-2.

Figure 3. Container shapes used as stimuli in Experiment 2.

Procedure

Participants looked at each container shape and then made a “guess” as to the most likely contents of that container shape. Participants were encouraged to identify more than one product type if they felt several different types of products could be found in a given container shape. In this case, they were asked to record the most likely first, followed by the next most likely, and so on. Participants were also encouraged to use actual product names (such as “Pine Sol”) if they could not think of a category name (“household cleaner”) to describe the type of product enclosed in the container shape. Participants were told to limit their “guesses” to household products, such as those that would be used in the yard and garden, garage, kitchen, bathrooms, and those that would be used for general household cleaning and redecorating. They were told not include food or health products.

Results

The data from Experiment 2 were sorted into groups of similar product types. For example, responses such as “Pine Sol,” “Mr. Clean,” and “dish detergent” were categorized as “Household Cleaning” products. Table 5 displays the frequency of occurrence (in percentages) of the product types for each container shape stimulus. Appendix F-1 contains bar graphs displaying the distribution of product types named for each of the container shape stimuli. Cohen’s kappa was used to assess the degree of agreement between the participants for the product types named for each container shape stimuli. For the product type naming, $\kappa = 0.4343$, $z = 54.735$, $p < .00003$. These results suggest that while there was the potential for an indefinitely large number of product

types, participants only identified the a small set of product types for each container shape.

Table 5

Frequency of Occurrence of the Named Product Types for each Container Shape
Stimulus: Experiment 2

	Container Shape				
	A	B	C	D	E
Product Type					
Automotive	3.4	13.8	29.3	27.6	8.6
Furniture Refinisher	0	29.3	0	0	1.7
Garden	0	3.4	0	13.8	0
Gasoline	0	10.3	1.7	25.9	0
Glue	1.7	3.4	0	0	1.7
Grease	0	0	0	0	1.7
Household Cleaner	43.1	1.7	25.9	15.5	5.2
Lighter Fluid	1.7	12.1	3.4	0	0
Tar	0	0	0	0	1.7
Wall-Treatment	1.7	3.4	0	0	41.4

Note. Values are presented as percentages.

A chi-square analysis was performed on the data presented in Table 5 to determine whether any product was named significantly more often for a container shape than any other products. While there was an indefinite number of products which could have been named for each container, all participant responses were encompassed by the ten product types in Table 5. A 10 x 5 contingency table of product type by container shape resulted in $\chi^2 = 484.740$, $p < .0005$. This chi-square indicates that product types were not randomly allocated across the container shapes.

Further chi-square analyses were performed on the individual container shapes to determine whether a product type was named significantly more often than the other

product types. Table 6 contains the chi-square values for each container shape.

Significant values, indicating that a product type was named significantly more often than chance, are printed in bold type.

Table 6

Chi-Square Analysis of Container Shapes for Product Type: Experiment 2

Container	"Significant" Product	Chi-Square	Asymp. Sig.
A	Household Cleaner	132.039	.0005
B	Furniture Refinisher	63.333	.0005
C	Automotive Treatment	27.535	.0005
D	--	7.651	.054
E	Wall-Treatment	136.667	.0005

Note. The cell containing the dash (--) indicate that there was no product type named significantly more often than other product types.

As can be seen in the chi-square, four out the five container shapes had a product type associated with them significantly more often than the other product types named. Thus, there does appear to be some relation between container shape and color. A secondary aim of this experiment was to validate the container shape choices made in Experiment 1. Because there were product types names more often than others for each of the container shapes, a comparison between the results of Experiment 1 and Experiment 2 can be made. In Experiment 1, participants were given a product and asked to select a container shape in which the product would be packaged. In Experiment 2, the task was turned around; participants were given a container shape and asked to identify what types of products they might find in that container shape. Five of the general categories of product types named in Experiment 2 correspond to the product types in Experiment 1 (household surface cleaner, furniture refinisher, automotive treatment,

concentrated garden pesticide, and wall-treatment/adhesive). A chi-square analysis was used to compare the results of Experiment 2 with the results of Experiment 1.

The frequency of product types named for each container shape stimulus from Experiment 2 were used as the observed values in the chi-square, while the frequency values of container selection for each product type from Experiment 1 were used as the expected values in the chi-square. Thus, the chi-square tested whether the product type namings in Experiment 2 for the five container shapes were different from the container shapes selected for the product types in Experiment 1. Table 7 presents the percentage of participants naming each product type in Experiment 2 and the percentage of participants selecting the container shapes in Experiment 1 used in Experiment 2 for the product types. The chi-square between the expected values from Experiment 1 and the observed values in Experiment 2 was $\chi^2 = 473.905$, $p < .0001$.

Table 7

Percentage of Participants Naming a Product for each Shape from Experiment 2 and Percentage of Participants Selecting a Container for each Product from Experiment 1

Shape	Household Cleaner		Furniture Refinisher		Automotive Treatment		Garden		Wall	
	Exp. 2	Exp. 1	Exp. 2	Exp. 1	Exp. 2	Exp. 1	Exp. 2	Exp. 1	Exp. 2	Exp. 1
80.0	32.2	0.0	7.7	33.3	5.5	20.0	4.4	6.6	1.1

0.0	12.2	46.6	35.5	0.0	13.3	0.0	5.5	0.0	11.1
6.6	5.5	16.6	25.5	53.3	27.7	30.0	28.8	6.6	0.0
0.0	7.7	3.3	7.7	0.0	8.8	3.3	37.7	0.0	1.1
0.0	1.1	0.0	13.3	0.0	11.1	0.0	5.5	73.3	44.4

Discussion

The intent of Experiment 2 was to explore the relation between container shape and the product(s) that should be contained in a shape. The chi-square suggests that there was a difference in the relation between container shape and product type from Experiment 1 to Experiment 2; this may have due to differences in the tasks for Experiment 1 and Experiment 2. Table 5 seemed to indicate that there were some container shapes and product types consistent with a common experience with consumer

products. A chi-square revealed that a particular product type was associated with four out of the five of the container shape stimuli significantly more often than other product types. Container Shape D was the only stimulus that did not have a product type associated with it significantly more often than others. By examining the data in Table 5, it appears that this container was viewed as likely to contain more than one type of product. This container shape was viewed as being able to hold automotive treatments or gasoline. Therefore, not every kind of container shape has a unique product type association. While every container shape did not have a unique product type association, four of the shapes did appear to have fairly strong associations with a single product type. This suggests that participants were able to draw on pre-existing knowledge and experiences with consumer products to identify the possible contents of a product package based on its shape.

A secondary aim of the experiment was to validate the container shape choices made in Experiment 1. The chi-square between the data from Experiment 1 and Experiment 2 suggests that there was a difference in the relation between container shape and product type from Experiment 1 to Experiment 2. This difference may have been due to differences in tasks for Experiment 1 and Experiment 2. Of note, however, is that the product types associated most often with the container shapes in Experiment 2 were the same products associated with the container shapes in Experiment 1.

Experiment 3

Introduction

The overall question of interest in Experiment 3 was the relation between the perceived hazardousness of a product and precautionary intent. In order to explore this question, the container shapes, colors, and product types from Experiment 1 were used in Experiment 3. These containers represented varying combinations of product type, container shape and container color and were selected to achieve a range of perceived product hazardousness. The characteristics of the product packages were confounded for container shape, color, and product type, in the sense that these characteristics were not manipulated orthogonally. While an orthogonal manipulation would have addressed the issue of the contributions of the container attributes (container shape and color) and contents, this would have produced an unwieldy set of stimuli, given the set of possible values for each product package characteristic. Additionally, an orthogonal manipulation would have “created” several product packages potentially inconsistent with and contrary to members of the public’s experience with consumer products. Thus, while this experiment addresses the relation of perceived product hazardousness to precautionary intent, it is not addressing the question of which product package characteristics (container shape, color, and product type) contribute to perceived hazard and precautionary intent.

Eight container shape/color/product type combinations were selected from the results of Experiment 1. These product container shape/color combinations were presented in Table 4. Two additional stimuli were added to this set for a total of 10

stimuli. These stimuli were added because the results of Experiment 1 did not produce a statistically significant container shape/color combination for all three hazard levels of a product type. The two additional stimuli represented two levels of hazard for furniture refinisher. For each of the ten product packaging stimuli, participants were asked to assess the hazards posed by the product. Finally, participants were given a list of precautionary measures that could be taken when using the product and asked to indicate, which, if any, of these precautions they would take in using the product. Ajzen and Fishbein (1980) assert that stated intentions are cognitively “near” an actual behavior, and therefore, any statements regarding precautionary intent can be taken as predictors of actual subsequent behaviors. Thus, in part, the purpose in probing precautionary measures is to look for an intent to engage in such behaviors, leading to Experiment 4.

Method

Participants

Thirty students from Rice University participated in Experiment 3 and received psychology course credit for their participation. There were 11 males and 19 females; the mean age of the participants was 19.2 years old, with a range of 17 - 22 years.

Participation was limited to those who had normal color vision and had not participated in either Experiment 1 or Experiment 2.

Materials

Stimuli. A chi-square analysis in Experiment 1 was performed to determine whether a container shape and color were selected significantly more often than the other container shapes and colors for each scenario. Eight of the 15 scenarios from Experiment

1 had both a container shape and color chosen significantly more often than the other container shapes and colors. Therefore, each product package resulting from Experiment 1 can be described as a container shape/color combination for a particular product. These eight container shape/color combinations were used in Experiment 3. Two additional container shape/color combinations were added to these eight for a total of 10 stimuli. The additional stimuli were added as a precursor for Experiment 4. Each of the product packages was color laser-printed on an individual 8 ½ by 11 inch sheet of paper. Beneath the picture of the product package, a short written description was included which described the function of the product enclosed in the package (i.e., “cleans household surfaces such as counter tops, etc.”). Figure 4 presents the product package stimuli used in Experiment 3. The order of the container shapes was randomized for each participant. See Appendix C-1 for the product package stimuli used in Experiment 3.

Stimulus	Product
A	Furniture Refinisher
B	Household Surface Cleaner
C	Furniture Refinisher

D		Automotive Treatment
E		Automotive Treatment
F		Automotive Treatment
G		Concentrated Garden Pesticide
H		Wall-Treatment/ Adhesive
I		Furniture Refinisher
J		Wall-Treatment/ Adhesive

Figure 4. Product package stimuli used in Experiment 3.

Product packaging response sheet. A questionnaire was used to probe hazard perceptions on seven different hazard scales and precautionary intent. The scales addressed the following hazards: overall hazardousness of package contents, ingestion hazard, inhalation hazard, skin contact hazard, hazardous to children, hazardous in closed spaces, and combustion hazard. A sample response sheet can be found in Appendix C-2.

Procedure

Participants were asked to examine the product package stimuli and rate each product package on the various hazard dimensions specified on the product packaging response sheet. Participants also identified which (if any) precautionary measures they would take if they had to use the product.

Results

Hazard Measures

The data on the seven hazard scales were submitted to a principal components analysis with Varimax rotation. Analysis of the eigenvalues revealed that one component was extracted, with eigenvalue of Component 1 = 4.699, accounting for 67.126% of the total variance attributable to the factor. As only one component was extracted, rotation was not performed. Components are defined by the combination of variables which comprise them. In order to assign a particular variable to a single component, it is desirable that the variable load highly on the component. All seven variables entered into the principal components analysis loaded highly on the extracted component. Table 8 shows the variable loadings for the extracted component. As the seven hazard variables all loaded highly on the extracted component, it appears that they are all assessing an

underlying hazard construct. A new variable was created by averaging each participants' responses across the seven hazard scales. This variable was named "Hazard" and was used for subsequent analyses; these values are shown in Table 9 for each product package stimulus collapsed across participants. The factor analysis is presented in Appendix G-1.

Table 8

Variable Loadings of the Hazard Scales on the Extracted Component: Experiment 3

Variable	Hazard Component
Hazardous Contents	.895
Inhalation Hazard	.877
Hazardous to Children	.844
Skin Hazard	.843
Closed Space Hazard	.828
Flammability Hazard	.715
Ingestion Hazard	.713

Table 9

"Hazard" Rating Collapsed across Participants for each Product Package Stimulus: Experiment 3

Product Package	Mean	Standard Deviation
A	6.0952	1.1752
B	4.0667	1.3368
C	6.0238	1.1041
D	5.7381	1.2128
E	5.9952	1.1681
F	5.7333	1.2660
G	5.2333	1.3838
H	3.1381	1.2372
I	3.5048	1.4265
J	5.4430	1.6523

A measure of interrater reliability was computed on the individual hazard scales for each of the product package stimuli. In this case, measures of interrater reliability were used to assess the degree of agreement among the ratings on the hazard scales for a single product package stimulus. Measures of interrater reliability are a measure of intraclass correlation, where the proportion of systematic variance in a set of judgments is assessed in relation to the total variance in judgments. These values are presented in Table 10 and exhibit a high degree of interrater agreement on the hazard scales, implying that the ratings on the hazard scales were influenced by the stimuli, rather than chance.

Table 10

Measures of Interrater Reliability on the Hazard Scales for each Product Package Stimuli:
Experiment 3

Container	Interrater Reliability
A	0.9137
B	0.8552
C	0.9278
D	0.9048
E	0.9230
F	0.9016
G	0.8581
H	0.9097
I	0.9001
J	0.8787

Safety Measures

Participants indicated precautionary intent by circling the precautionary measures they would most likely take if they had to use the product described in each stimulus. Each item was worth one “point.” The number of items indicated for each stimulus was totaled to create an index of the intended precaution. This safety index was used for

subsequent analyses. Table 11 presents the frequency of selection of each precautionary measure for each product package stimulus and the safety index for each product package.

Table 11

Frequency of Selection for each Precautionary Measure and Safety Index for each Product Package Stimulus: Experiment 3

Container	Precautionary Measures					Safety Index
	Label	Gloves	Goggles	Apron	Mask	
A	30	22	5	9	11	2.5
B	28	18	1	4	2	1.7
C	30	22	3	10	9	2.4
D	29	10	4	4	4	1.7
E	30	14	6	6	6	2.0
F	30	11	5	4	5	1.8
G	30	20	10	5	8	2.4
H	28	11	1	3	0	1.4
I	30	23	5	9	11	2.6
J	27	14	3	8	1	1.7

Note. The Safety Index is the mean of the precautionary measure frequencies: [(label + gloves + goggles + apron + mask)/# of participants].

Previous research has indicated that precautionary intent is strongly correlated with perceived hazard; as the perception of hazard increases, so does the likelihood of engaging in precautionary behaviors (Martin & Wogalter, 1989; Wogalter, Brelsford, Desaulniers, & Laughery, 1991; Wogalter, Brems, & Martin, 1993; Wogalter, Desaulniers, & Brelsford, 1986). The overall effect of perceived hazard on precautionary intent was tested through regression, with the safety index regressed on the hazard rating for the stimulus. The values in this regression were the individual safety index and “Hazard” rating for each participant on each product package stimulus; therefore, there

were 300 sets of safety index values and hazard ratings. This resulted in $R = 0.514$, and $R^2 = 0.265$. With $F(1, 298) = 107.171$, $p < .0005$, the hazard ratings accounted for a significant amount of the variation in the amount of safety precautions taken. Logistic regression was also used to determine if two of the individual hazard scales predicted an intent to engage in an appropriate safety precaution. Intent was measured as a dichotomous variable for each precautionary measure (yes = 1 and no = 0). The specific comparisons were: wearing gloves predicted by the Skin Hazard scale, wearing goggles predicted by the Skin Hazard scale, wearing an apron predicted by the Skin Hazard scale, and wearing a mask predicted by the Inhalation Hazard scale. These analyses are presented in Table 12. All were highly significant.

Table 12

Individual Precautionary Behaviors Predicted by Corresponding Hazard Scale:
Experiment 3

Precautionary Measure	Hazard Scale	R	Std. Error	Wald χ^2	Sig.
Wearing Gloves	Skin Hazard	.2852	.0620	35.5934	.0005
Wearing Goggles	Skin Hazard	.3099	.1085	25.6786	.0005
Wearing Apron	Skin Hazard	.1928	.0744	13.3616	.0003
Wearing Mask	Inhalation Hazard	.3754	.1257	43.1125	.0005

While earlier analyses examined the relation between the perceived hazardousness of a product and precautionary intent, another question is the relation between the individual product package stimuli and precautionary intent. A one-way ANOVA on the product package stimuli and safety index values resulted in $F(9, 290) = 22.371$, $p < .0005$.

Thus, differences in safety index values can be attributed to the product package stimuli. Post-hoc comparisons using Tukey's HSD identified the product packages with significant differences between safety index values. These comparisons appeared to split the product package stimuli into two groups. Figure 5 presents a histogram showing the relative difference in safety index between the two groups of product package stimuli. See Appendix G-2 for the ANOVA results and Tukey HSD.

Figure 5. Differences between product package stimuli groups for safety index values.

While the ANOVA indicates that the product packages influenced precautionary intent, the product packages are still confounded on the properties of container shape, color, and product type. However, analyses were able to be performed on three sets of product package stimuli that differed in only one variable. Two sets were examined for the influence of color (container shape and product type were matched), while the third set was examined for the influence of container shape (color and product type were matched) on precautionary intent. Table 13 presents the analyses for these three sets of

product package stimuli. It can be seen that the variable investigated in each case appeared to have little influence on the amount of intended precautionary measures. One explanation for this lack of influence may be that the product type influenced the amount of intended precautionary measures. However, as the effect of this variable could not be examined, it is difficult to say whether product type influenced the amount of intended precautionary measures. Appendix G-3 presents the ANOVA results for each product package set.

Table 13

Analysis for the Influence of Color or Container Shape on Precautionary Intent:
Experiment 3

Stimuli	Variable Investigated	F	df	Significance
A, C, I	Color	.134	2, 87	.875
H, J	Color	1.984	1, 58	.164
E, F	Container Shape	.676	1, 58	.414

A “safety profile” was created for each product package stimulus. Each profile contains the percentage of participants indicating an intention to engage in a particular precautionary behavior (i.e., wearing gloves) for that product package stimulus. Table 14 presents the safety profile for each stimulus. These profiles will be used to predict actual precautionary behavior in Experiment 4. Appendix G-4 contains bar graphs displaying the distribution of intent to engage in each precautionary behavior for each product package stimulus.

Table 14

Safety Profiles for each Product Package Stimulus: Experiment 3

Stimulus	Product Type	Safety Measure	Profile (in percentages)
A	Furniture Refinisher	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	100.00 73.33 16.67 30.00 36.67
B	Household Surface Cleaner	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	93.33 60.00 3.33 13.33 3.33
C	Furniture Refinisher	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	100.00 73.33 10.00 33.33 30.00
D	Automotive Treatment	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	96.67 33.33 13.33 13.33 13.33
E	Automotive Treatment	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	100.00 46.67 20.00 20.00 20.00
F	Automotive Treatment	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	100.00 36.67 16.67 13.33 16.67
G	Concentrated Garden Pesticide	Read Label Wear Gloves Wear Goggles Wear Apron Wear Breathing Mask	100.00 66.67 33.33 16.67 26.67

H		Wall-Treatment/ Adhesive	Read Label	93.33
			Wear Gloves	36.67
			Wear Goggles	3.33
			Wear Apron	10.00
			Wear Breathing Mask	0.00
I		Furniture Refinisher	Read Label	100.00
			Wear Gloves	76.67
			Wear Goggles	16.67
			Wear Apron	30.00
			Wear Breathing Mask	36.67
J		Wall-Treatment/ Adhesive	Read Label	90.00
			Wear Gloves	46.67
			Wear Goggles	10.00
			Wear Apron	26.67
			Wear Breathing Mask	3.33

Discussion

Experiment 3 was intended to explore the relation between the perceived hazardousness of a product package, including its contents, and precautionary intent. When given the product package (container shape, color, and product type), participants were asked to assess the various hazards associated with each product package. As discussed in the Introduction and Overview, previous research has found precautionary intent to be strongly correlated with the severity of injury which could result from using a product. Previous research has also found that severity of injury appears to be the primary determinant of product hazard perceptions, and thus, hazard perception is correlated with precautionary intent. This was supported by the results of Experiment 3, which indicated that the perceived hazardousness of the product package stimuli influenced the amount of precautionary measures participants intended to take. Correlations were also found between hazard ratings on the individual hazard scales and the intent to engage in a corresponding precautionary behavior.

The safety profiles created for each container appeared to follow a pattern which could be associated with cost of compliance. Reading a label appeared to be the most frequently stated intention of precautionary behavior for all of the product package stimuli. Assuming that the product package has the label printed on it, reading a label requires a relatively low level of compliance; the label is already printed on the product package, all the consumer has to do is locate the label on the package and read it. As the potential cost of compliance appeared to increase, however, participants became less likely to identify an item as an intended precautionary measure. For example, after reading a label, wearing gloves was the next most frequently selected intention of precautionary behavior for many of the product packages. As gloves are generally not packaged with most consumer products, the consumer must actively retrieve a pair of gloves to wear during product use, thereby incurring a higher cost of compliance than merely reading a label already present on a product package.

Additionally, with regard to gloves, the product package stimuli all represent products that consumers will handle with their hands. Thus, it would be expected that precautionary intent for wearing gloves may be higher than for the other safety measures. Wearing goggles and an apron can also be related to the concept of “manual handling.” The implied hazard with manual handling is a skin contact hazard. While gloves would specifically protect the hands, goggles may protect the eyes from chemical splashes and the apron may protect other exposed areas of the body (or even clothing) from chemical splashes. The lower values of stated intent to wear goggles and an apron may be related to a lack of knowledge about what may occur during product use. While it may seem

apparent that a substance could accidentally come into contact with the hands during product use (since it is being handled directly by the hands), it seems more unlikely that the product will come into contact with their eyes or other exposed areas of body. Thus, intentions to goggles and an apron may be less than the precautionary intent for gloves because the hazards indicating the use of these items may be less apparent. The safety profiles created in Experiment 3 will be analyzed with the actual precautionary actions taken in Experiment 4 to address the question regarding the relation between precautionary intent and actual precautionary behaviors.

Experiment 4

Introduction

The purpose of Experiment 4 was to continue to investigate the relation between the perceived hazardousness of a product and precautionary intent. Furthermore, this experiment sought to determine whether participants would engage in precautionary behaviors when faced with a task in they were asked to interact with a product. The study also explored the manipulation of hazard level through differences in product package color and its subsequent influence on perceived hazardousness of the product and precautionary intent. Three product packages from Experiment 3 were used as the stimuli in Experiment 4; container A, container C, and container I. These product packages were presented in Figure 4. These three product packages have the furniture refinisher product in common and are the same shape. The only product package characteristic manipulated in Experiment 4 is color: Container A is white, container I is yellow, and container C is red.

Method

Participants

Thirty-three students from Rice University participated in Experiment 4 and received psychology course credit for their participation. There were 11 males and 22 females; the mean age of the participants was 19.5 years old, with a range of 18 - 22 years. Participation was limited to those who had normal color vision and had not participated in Experiment 1, Experiment 2, or Experiment 3. The data from two participants were not used as they did not follow the directions given by the experimenter; therefore, the data from 31 participants were used in the following analyses.

Materials

Participants were taken to a room equipped with materials for a furniture refinishing task. Upon entering, the participants saw a table with several pieces of equipment. There were three containers identified as holding a paint stripper. These containers were metal, rectangular 8 ounce maple syrup cans spray-painted one of three colors with Krylon spray paint: red, yellow, or white. The containers were identified as follows: red was "A," yellow was "B," and white was "C." Each of these containers represented a different potential level of hazard. The red container represented high hazard, the yellow container represented moderate hazard, and the white container represented low hazard. The ordering of these colors corresponds to previous research on the ordering of colors for hazard connotation (Braun & Silver, 1995; Chapanis, 1994). See Figure 6 for a representation of the three product packages used in Experiment 4. The containers were filled with water to simulate the presence of paint stripper in the

containers. A paint brush and cheese cloth were located next to the containers. The following personal protective equipment was located next to the paint brush and cheese cloth: chemical resistant gloves, safety glasses, coverall, and a breathing mask. A basket was set at the back of the table where participants could place the equipment they would need. By placing these items within easy reach of the participants, the cost of compliance for precautionary measures was low. This was done deliberately, as the cost of compliance was not of interest at this time. See Appendix D-1 for a diagram of the equipment table layout.

A questionnaire was used that asked participants to make an initial hazard rating of the product selected, identify the container they chose, the precautionary measures taken for the selected container, and then to compare all three containers for hazard perception. The questionnaire can be found in Appendix D-2.

Figure 6. Representation of the containers used in Experiment 4.

Procedure

Participants were taken individually to a room where they were given the following information:

“You are an employee at Dot’s Furniture Builders. Your job there is as a refinisher, which means that when a client brings in a piece of furniture, you strip off any old finish (paint, varnish, etc.), clean up the item and prepare it for a new finish, and apply the new finish. Lately, Dot has been having complaints from the refinishers about their equipment. Since she wants satisfied workers in her factory, she has decided to run an experiment. She is comparing the satisfaction of the refinishers when they get to choose their own equipment with their satisfaction when they are assigned a set of equipment. You get to choose your own equipment today, so why don’t we go over to the table and select what you think you will need. Then I’ll take you to another room set up with a piece of furniture and you’ll spend some time removing the old finish and then fill out a questionnaire. The first thing you will need is a paint stripper. Dot buys three different kinds to use in the factory; they are all effective at stripping off the old finish, but they might take different amounts of time to work effectively, and there might be some different hazards associated with them. So why don’t you pick one of these containers and any other equipment you will use and we can go to the next room.”

Once the participants selected a container and any personal protective equipment, the participants were told that they did not have to strip paint off of a piece of furniture, but that they needed to complete a questionnaire. Participants then completed the questionnaire probing their perceptions of the container and safety equipment they selected, and the relative hazardousness represented by each of the containers.

Results

The participants in Experiment 4 had two tasks. The first task was to select a container of paint stripper from the three presented and any safety equipment the participants wanted to use. The second task was to evaluate all three containers for perceived hazard and for precautionary intent had they been asked to use the contents of each of the containers. The results are divided into two sets of analyses. The *Selected Container Analyses* used the data from the first task, while the *Container Evaluation Analyses* used the data from the second task.

Selected Container Analyses

Chi-square analysis was used to determine if there was a container chosen significantly more often than the other containers. The frequency of selection for the containers was Red = 12, Yellow = 7, and White = 12, with $\chi^2 = 1.613$, $p < .446$. Thus, no container was chosen significantly more often than the others. Cohen's kappa was used to assess the degree of agreement between the participants for the containers selected; $K = 0.03$, $\kappa = 0.665$, $p < .2546$. These results indicate that there was no effect of the containers on the selection process.

A manipulation check was performed on the level of hazard. Participants were given a 9-point scale ranging from slightly hazardous to extremely hazardous and asked to indicate their perception of the potential hazardousness of the contents of the selected container. The mean hazard rating and standard deviation for each container were: for the red container, $\bar{M} = 5.08$, $SD = 1.08$, $N = 12$; for the yellow container, $\bar{M} = 2.28$, $SD = 0.48$, $N = 7$; and for the white container, $\bar{M} = 3.50$, $SD = 1.76$, $N = 12$. Results from a one-

way between-subjects ANOVA showed that the manipulation of hazard level was partially successful, $F(2, 28) = 4.664, p < .018$. A trend analysis was performed on the hazard rating data, revealing a significant linear component, $F(1, 28) = 9.288, p < .005$. Comparisons using the Tukey HSD revealed significant differences between the lowest and highest levels of hazard. The ANOVA results, Tukey HSD, and the means and standard deviations for each level of hazard are presented in Appendix H-1.

Participants indicated the precautionary actions taken by circling the items on the response sheet corresponding to the items they selected from the equipment table. Each item was worth one “point.” The number of items indicated for the selected product package was totaled to create an index of safety. Table 15 presents the frequency of selection of each precautionary measure for each container stimulus and the safety index for each container. Regression was used to determine the effect the perceived hazardousness of the selected product package had on predicting the safety index. For the safety index regressed onto the rating of perceived hazard, $R = 0.068$, and $R^2 = 0.005$; $F(1, 29) = 0.133, p < .718$. A one-way between-subject ANOVA for the selected container and safety index supported this finding, resulting in $F(2, 28) = .208, p < .814$. Thus, the perceived hazard of the product package selected appeared to have little predictive effect for the amount of precautionary behavior taken. The ANOVA results, Tukey HSD, and the mean safety index and standard deviations for each container are presented in Appendix H-2.

Table 15

Frequency of Selection for each Precautionary Action and Safety Index for each Container: Experiment 4

Container	Precautionary Actions				
	Gloves	Goggles	Apron	Mask	Safety Index
A	11	9	5	12	3.08
B	7	4	2	7	2.85
C	12	6	5	12	2.96

Note. The Safety Index is the mean of the precautionary measure frequencies: [(gloves + goggles + apron + mask)/# of participants].

A “safety profile” was created from the safety equipment selection data for each container. This profile is the percentage of participants choosing a particular container selecting the various items of safety equipment. Table 16 presents the safety profile for each container. A bar graph displaying the distribution of selection for the various items of safety equipment for each of the product packages is presented in Appendix H-3.

Table 16

Between-Subjects Safety Profiles for Selected Container: Experiment 4

Container	Safety Measure	Profile (in percentages)
Red	Wear Gloves	91.00
	Wear Goggles	75.00
	Wear Coverall	41.00
	Wear Breathing Mask	100.00
Yellow	Wear Gloves	100.00
	Wear Goggles	57.00
	Wear Coverall	28.00
	Wear Breathing Mask	100.00
White	Wear Gloves	100.00
	Wear Goggles	50.00
	Wear Coverall	41.00
	Wear Breathing Mask	100.00

A measure of the precautionary behaviors taken in Experiment 4 was obtained by comparing the precautionary intent expressed in Experiment 3 with the actual behaviors performed in Experiment 4. Chi-square analysis was used to compare the safety profiles from Experiment 4 with the safety profiles from Experiment 3. The three product packages used in Experiment 4 correspond to stimuli A, C, and I from Experiment 3. Table 17 presents the safety profiles from Experiment 4 and Experiment 3 for the three stimulus containers. The safety profiles from Experiment 4 were used as the observed values in the chi-square, while the safety profiles from Experiment 3 were used as the expected values in the chi-square. Thus, this analysis tested whether the precautionary actions taken in Experiment 4 for the three containers differed from the precautionary intent expressed in Experiment 3 for the three containers. The chi-square between the expected values in Experiment 3 and the observed values in Experiment 4 was $\chi^2 = 997.404$, $p < .0005$. As can be seen in Table 17, participants tended to take more precautionary actions in Experiment 4 than was indicated by the statements of precautionary intent in Experiment 3.

Table 17

Precautionary actions in Experiment 4 and Precautionary Intent in Experiment 3 for Stimulus Containers

Container	Safety Measure	Profile (Experiment 4)	Profile (Experiment 3)
Red	Wear Gloves	91.00	73.33
	Wear Goggles	75.00	10.00
	Wear Coverall	41.00	33.33
	Wear Breathing Mask	100.00	30.00

Yellow	Wear Gloves	100.00	76.67
	Wear Goggles	57.00	16.67
	Wear Coverall	28.00	30.00
	Wear Breathing Mask	100.00	36.67
White	Wear Gloves	100.00	73.33
	Wear Goggles	50.00	16.67
	Wear Coverall	41.00	30.00
	Wear Breathing Mask	100.00	36.67

Note. Profiles expressed in percentages.

Participants completed an open-ended question addressing the reasons why they selected a particular container and set of safety equipment. Appendix H-4 contains the responses made by the participants to the open-ended question.

Container Evaluation Analyses

The data on the seven hazard scales were submitted to a principal components analysis with Varimax rotation. Analysis of the eigenvalues revealed that one component was extracted, with the eigenvalue for Component 1 = 4.338, accounting for 61.974% of the total variance attributable for each factor. As only one component was extracted, rotation was not performed. All seven variables entered into the principal components analysis loaded highly on the extracted component. Table 18 shows the variable loadings for the extracted component. As the seven hazard variables all loaded highly on the extracted component, it appears that they are all assessing an underlying hazard construct. A new variable was created by averaging each participants' responses across the seven hazard scales. This variable was named "Hazard" and was used for subsequent analyses; these values are shown in Table 19 for each container stimulus collapsed across participants. The factor analysis is presented in Appendix H-5.

Table 18

Variable Loading of the Hazard Scales on the Extracted Component: Experiment 4

Variable	Hazard Component
Inhalation Hazard	.866
Hazardous Contents	.836
Skin Hazard	.815
Closed Spaces Hazard	.777
Hazardous to Children	.754
Ingestion Hazard	.727
Flammability Hazard	.725

Table 19

“Hazard” Rating Collapsed across Participants for each Container: Experiment 4

Product Package	Mean	Standard Deviation
Red (High)	6.5853	1.247
Yellow (Moderate)	5.4700	.8461
White (Low)	4.6083	1.3248

A manipulation check was performed on the level of hazard represented by each of the product package stimuli. The new “Hazard” variable was used as the dependent measure. See Table 18 for the mean Hazard ratings for the level of hazard represented by each stimuli. Results from a one-way ANOVA showed that when participants compared all three containers, the manipulation of hazard was successful, $F(2, 90) = 23.010$, $p < .0005$. A trend analysis was performed on the hazard ratings, revealing a significant linear component, $F(1, 90) = 45.769$, $p < .0005$. Comparisons using the Tukey HSD revealed significant differences between all three levels of hazard. The ANOVA results,

Tukey HSD, and the means and standard deviations for each level of hazard are presented in Appendix H-6.

Participants indicated precautionary intent by circling the precautionary measures they would most likely take if they had to use the product contained in each of the product packages; in other words, participants indicated precautionary intent for all three container stimuli. Each item was worth one “point.” The number of items indicated for each stimulus was totaled to create an index of the intended precaution. This safety index was used for subsequent analyses. Table 20 presents the frequency of selection of each precautionary measure for each container stimulus and the safety index for each container. A one-way ANOVA demonstrated that the manipulation of hazard level influenced safety precautions; $F(2, 90) = 8.623, p < .0005$. A trend analysis revealed a significant linear component, $F(1, 90) = 17.05, p < .0005$. Comparisons using the Tukey HSD revealed significant differences between the low and moderate hazard levels and the low and high hazard levels. The ANOVA results and the Tukey HSD are presented in Appendix H-7.

Table 20

Frequency of Selection for each Precautionary Measure and Safety Index for Container Evaluations: Experiment 4

Container	Precautionary Actions				Safety Index
	Gloves	Goggles	Apron	Mask	
A	30	25	20	30	3.38
B	31	23	11	29	3.03
C	29	19	10	20	2.51

Note. The Safety Index is the mean of the precautionary measure frequencies: [(gloves + goggles + apron + mask)/# of participants].

A “safety profile” was created for each product package from the precautionary intent statements. These safety profiles were based on the statements of precautionary intent made in the product package comparison task. Each profile contains the percentage of participants indicating an intent to engage in the various precautionary behaviors. Table 21 presents the safety profile for each container. A bar graph displaying the distribution of selection for the various items of safety equipment for each of the product packages is presented in Appendix H-8. The safety profiles seem to display the same pattern in intending to use the various items of safety equipment. Gloves have a high stated intent, and then intent to wear safety glasses and the coverall drop, only to have intent for wearing the breathing mask increase. While the percentage of participants indicating an intention to engage in these behaviors decreases as the hazard level decreases, the pattern of intent appears to remain the same.

Table 21

Safety Profiles for each Container Stimulus: Experiment 4

Container	Safety Measure	Profile (in percentages)
Red	Wear Gloves	96.8
	Wear Goggles	80.6
	Wear Coverall	64.5
	Wear Breathing Mask	96.8
Yellow	Wear Gloves	100.00
	Wear Goggles	74.2
	Wear Coverall	35.5
	Wear Breathing Mask	93.5
White	Wear Gloves	93.5
	Wear Goggles	61.3
	Wear Coverall	32.3
	Wear Breathing Mask	64.5

The precautionary intent stated in Experiment 4 was compared with the statements of precautionary intent in Experiment 3. Chi-square analysis was used to compare the safety profiles from Experiment 4 with the safety profiles from Experiment 3. The three product packages used in Experiment 4 correspond to stimuli A, C, and I from Experiment 3. Table 22 presents the safety profiles from Experiment 4 and Experiment 3 for the three stimulus containers. The safety profiles from Experiment 4 were used as the observed values in the chi-square, while the safety profiles from Experiment 3 were used as the expected values in the chi-square. Thus, this analysis tested whether the statements of precautionary intent in Experiment 4 for the three containers differed from the precautionary intent expressed in Experiment 3 for the three containers. The chi-square between the expected values in Experiment 3 and the observed values in Experiment 4 was $\chi^2 = 1124.894$, $p < .0005$. These results indicate that statements of precautionary intent in Experiment 4 were significantly different from statements of precautionary intent in Experiment 3.

Table 22

Precautionary Intent in Experiment 4 and Precautionary Intent in Experiment 3 for Stimulus Containers

Container	Safety Measure	Profile (Experiment 4)	Profile (Experiment 3)
Red	Wear Gloves	96.8	73.33
	Wear Goggles	80.6	10.00
	Wear Coverall	64.5	33.33
	Wear Breathing Mask	96.8	30.00

Yellow	Wear Gloves	100.00	76.67
	Wear Goggles	74.2	16.67
	Wear Coverall	35.5	30.00
	Wear Breathing Mask	93.5	36.67
White	Wear Gloves	93.5	73.33
	Wear Goggles	61.3	16.67
	Wear Coverall	32.3	30.00
	Wear Breathing Mask	64.5	36.67

Another interesting question is whether the participants who intended to engage in a particular precautionary behavior (wear gloves, wear goggles, wear apron, wear breathing mask) versus the participants who did not had a different perception of hazard for the situation. Table 23 presents the mean standardized hazard ratings across the three container stimuli for each of the precautionary measures for the participants who intended to engage in the precautionary behavior and those who did not. The data appear to demonstrate that participants with a positive intent to engage in a particular precautionary behavior perceived the container stimuli as more hazardous than the participants indicating a negative intent to engage in a precautionary behavior. A t-test for the difference between the two groups resulted in $t = 3.25$, $p < .05$. Thus, it appears that the participants stating an intention to engage in a particular precautionary behavior perceived the container stimuli as more hazardous than the participants who did not intend to engage in a particular precautionary behavior.

Table 23

Mean Hazard Ratings Across Containers for Participant Statements of Precautionary Intent: Experiment 4

Precautionary Measure	Positive Intent		Negative Intent	
	Mean	S.D.	Mean	S.D.
Wear Gloves	5.6048	1.3931	4.0476	.3595
Wear Goggles	5.6738	1.4248	5.2473	1.3059
Wear Apron	6.0000	1.3586	5.2033	1.3405
Wear Breathing Mask	5.7902	1.3085	4.2245	1.1548

Discussion

The intent of Experiment 4 was to determine whether the results of the previous experiments would hold up when participants were faced with a task in which they were expected to actually use a product. The results concerning the selected container and safety equipment revealed interesting patterns when compared to the previous experiments. First and foremost, when allowed to choose a container, there appeared to be no criterion or rule upon which selection choices were made. Additionally, when participants had to select safety equipment, they generally selected more equipment than was indicated by the precautionary intent measures in Experiment 3. The differences between Experiment 4 and the previous experiments seems to lie in the nature of the task. The participants were able make judgments regarding the product packages on “paper and pencil tasks,” however, when faced with a “real” situation, participants did not appear to make any comparisons of the three product packages. In free response, participants expressed unfamiliarity with the task which they would be asked to perform (stripping paint) and that because they knew little about the task, they chose a container to use more

or less at random. Because the only difference between the containers was in their color, participants made guesses that color may be somehow associated with the relative strength of each of the paint strippers.

When choosing safety equipment, the participants appeared to respond to the characteristics of the “paint stripping” task itself. For example, gloves were chosen because using paint stripper could be “messy” and breathing masks were chosen because paint stripper “probably smells bad.” In general, however, the participants did not respond to the *hazards* posed by the product. In other words, gloves were not chosen because prolonged exposure to paint thinner can cause a rash or chemical burns and a breathing mask was not chosen because the paint stripper fumes were potentially toxic if inhaled over a long period of time.

Thus, the results pertaining to the selected container and safety equipment are mixed. Participants were not able to reliably select a container and assess its hazard based on its color. However, participants selected more safety equipment than was indicated by the safety profiles from Experiment 3. To some extent, this may be due to the cost of compliance associated with selecting the items in Experiment 4. The cost of compliance was deliberately made as low as possible, as it was not a variable of interest in this experiment. Thus, participants may have selected equipment in this instance that in other situations they may not have if the cost of compliance was higher.

When the participants were asked to evaluate all three containers for hazard, however, the results of Experiment 4 essentially followed those of Experiment 3. Thus, the difference between a “paper and pencil task” and a “real task” once again emerged. In

this case however, there was a significant effect of hazard level for all three levels of hazard. Once again, however, when it came to indicating precautionary behavior, the safety profiles from Experiment 4 indicated a higher degree of precautionary intent than Experiment 3. These precautionary intentions may have been influenced by the earlier selection task with the low cost of compliance. Therefore, these results may not translate to other situations in which the cost of compliance could vary.

GENERAL DISCUSSION

Much of the work done in these Experiments has already been discussed in the sections for the individual experiments. However, a general discussion examining the combined results of all four experiments is warranted. The experiments were intended to address the following questions: ‘Does experience with containers influence expectations about the hazardousness of the materials in the containers?’ and ‘Does the perceived hazard of a product influence precautionary intent/behavior?’ Experiments 1 and 2 explored the first question and Experiments 3 and 4 explored the second question.

Experiments 1 and 2 addressed questions about members of the public’s experience with product types, container shapes, and colors and how these characteristics mapped onto perceptions of hazardousness. Experiment 1 demonstrated that there was a relatively high level of agreement between a product type and the type of product package (container shape and color) in which it was placed. Experiment 2 reversed this and demonstrated that participants could agree on which types of products could be found in the various container shapes. The results of these two experiments support the idea that members of the public appear to have common experiences with consumer products. This idea of common experiences seems to point to the availability and representativeness heuristics.

The availability heuristic is used for judgments on estimations of class size and the likelihood of an event occurring. These judgments are made by assessing the ease with which the relevant cognitive operations of retrieval, construction, or association can be carried out (Tversky & Kahneman, 1973). Availability is brought to bear in situations

where the frequency or probability of a class is assessed by the ease with which instances can be brought to mind. The representative heuristic is a heuristic used to answer questions such as “what is the probability that object A belongs to class B?” In other words, what is the probability of a robin being a bird? In the representative heuristic, a person evaluates the degree to which something is similar in its essential properties to a parent population (Kahneman & Tversky, 1982a; Kahneman & Tversky, 1982b; Tversky & Kahneman, 1982).

The results of Experiment 1 can be viewed in terms of the representativeness heuristic. Participants in this experiment were essentially asked to create a product package which would be representative of the information contained in a scenario. Given the container shape and color sets, participants selected shapes and colors most representative of the product and the hazard level. This was turned around in Experiment 2, where participants had to identify the potential contents of a container shape. In this case, the results reflect the availability heuristic. Participants selected the first product type to come to mind for each container. According to the availability heuristic, the fact that a product was brought to mind implies that it is most often associated with the particular container shape.

The availability and representativeness heuristics are related to the concept of schemas. Schemas are an abstract way of encoding the regularities in categories; those regularities which determine a representative member of the set. When people are asked to think of a category member, they generally think of typical, representative, instances of the category. Furthermore, the typical members of a category are more quickly

recognized than atypical members (Anderson, 1990). Therefore, the most readily available members are the most representative of the set.

Schemas and the two heuristics play a role in product identification and hazard perception. Consumers appear to rely on other means of information above and beyond the printed information on a product. Experience plays a role; experience with certain types of products typically being packaged in certain types of containers. Thus, when confronted with a product package, members of the public instantiate a schema regarding what they expect the product to be on the basis of container shape and color. The product which comes to mind will generally be the most available product type for the product package, as well as the most representative product found in the product package.

Experiments 3 and 4 addressed questions about how perceived hazard can influence precautionary intentions/behaviors. The results of Experiment 3 and Experiment 4 both appeared to demonstrate that as perceived hazard of the product increased, the intention to engage in precautionary measures increased. By comparing the results of Experiment 3 and Experiment 4, some conclusions can be drawn regarding the relation between precautionary intent and precautionary action. Participants indicated precautionary intent in Experiment 3 and precautionary intent by actually selecting safety equipment for use in Experiment 4. It might be expected that there would be a higher degree of precautionary intent than actual precautionary action; it may “easier” to say that you will do something than actually doing it when the situation arises. However, the results of Experiments 3 and 4 indicated that participants were more likely to engage in precautionary actions in Experiment 4 than was indicated by precautionary intent in

Experiment 3. These results may be attributable to any number of explanations. Two likely explanations include the characteristics of the task in Experiment 4 and demand characteristics.

The paint stripping task used in Experiment 4 may have influenced judgments of perceived hazard and in turn, influenced the precautionary actions taken. This task was chosen primarily because it was relatively easy to create a situation in which participants could believe they would actually be engaging in the task and that the focus of the experiment was on something other than safety. In other words, there was a certain amount of face validity to the task. However, the fact that paint stripping was an unfamiliar task to the participants may have influenced the results. Familiarity with a task or product has been shown to influence hazard perceptions (Desaulniers, 1989; Wogalter, Brelsford, Desaulniers, & Laughery, 1991; Wogalter, Desaulniers, & Brelsford, 1987). In particular, familiarity with a product is significantly and negatively related to hazard ratings of consumer products. Thus, since the participants were largely unfamiliar with paint strippers and the actual task of stripping paint, they may have assessed this situation as relatively hazardous, and acted accordingly by selecting more of the available safety equipment than was indicated by the precautionary intent measures in Experiment 3.

Finally, demand characteristics may have influenced the results of the experiments. The participants all knew they were in an experimental situation and were therefore being observed, and that certain things were expected of them. The participant population used in these experiments makes the demand characteristics all the more

important. The Rice University population of undergraduates is pre-selected according to intelligence, and the age range is primarily from 18 to 22 years of age. These students are generally motivated to “find out what the experimenter wants and give it to her.” Thus, when participants were asked to select equipment in Experiment 4, they may have realized that this was key to the experiment and selected more equipment than they would had it not been an experimental situation.

The use of schemas may also have influenced the results in Experiment 4. In this experiment, participants were told what was in the containers, thereby instantiating any pre-existing knowledge the participants had regarding paint strippers. This pre-existing knowledge came with expectancies about how the product was used and the physical characteristics of the product. Through free response, participants indicated that using paint stripper was “messy,” that it could splash if poured from the container too quickly, that the fumes smelled “bad,” and that they could get it on their hands. The free response answers seemed to indicate little knowledge of the hazards associated with paint stripper; rather, the previous knowledge brought to mind focused on characteristics of *using* the product, rather than characteristics *of* the product itself. It appeared that participants made judgments of perceived hazard and selected safety equipment based on these considerations regarding the characteristics of product use. An important point is that while the participants appeared to be responding to the hazard manipulations, the results may have been influenced by factors not related to the manipulation.

In this case, then, the cue of container color did not have the desired effect of signaling the relative hazard of each of the containers. It seems that when participants

were asked to actually engage in the task, they made use of little information, and most of this information had little to do with consumer safety. However, when asked to compare the three containers, the participants had little trouble assigning hazard ratings. This may be a particularly useful finding. Consider a consumer at the hardware store buying paint stripper. There may be at least ten different brands on the shelf. How does the consumer make any distinctions between them? It appears that in this situation, the relative hazard of the paint stripper may have little impact on the buying decision. Thus the question becomes: while consumer product hazard was successfully signaled through “paper and pencil” tasks, how do you get consumers to consider relative hazard when they actually interact with a product?

Given actual containers, color did not appear to be a successful cue for signaling hazard. However, as previously discussed, color on product packaging is often used to create a “natural” association with the enclosed product. For example, blue plastic “paint cans” are often associated with pool chemicals, household cleaner containers colored yellow are associated with “lemon power” while the same containers colored green are associated with “fresh as a pine forest.” Thus, the containers instantiate several stereotypes regarding the enclosed product, many of which have nothing to do with consumer safety and relative hazard.

The apparent limitation of color as a cue for signaling hazard may be related to the instantiation of various “marketing” associations as described earlier (e.g., green for garden). However, another explanation may lie in Gestalt psychology explanations of perception. According to Gestalt psychology, the recognition of an object is based on the

perception of the whole pattern of stimuli. In other words, the parts are perceptually grouped into unitary, identifiable shapes or configurations. These perceptual units are natural units which possess some type of psychological reality.

Classical Gestalt psychology has identified several factors which influence the grouping of “parts into a whole.” These factors can be divided into two types: those that are potentially measurable aspects of a stimulus and those that are grouped so as to produce the “best,” most stable organization of the object. The first type of factor has been associated with certain laws of grouping, such as similarity, proximity, and common fate. The second type of factor has been associated with concepts of good figure, good continuation, and Prägnanz. The distinction between these two factors has been associated with the difference between bottom-up and top-down processing. Grouping by similarity, proximity, and common fate can be accomplished by bottom-up processing, while grouping based on good figure, good continuation, or Prägnanz can be accomplished by top-down processing.

As a consequence of grouping, information processing becomes holistic. A major consequence of grouping a perceptual scene into segmented and coherent units is that these units should be *relatively indivisible*. Additionally, the organized units can be recognized faster and better than the parts from which the whole was constructed (Pomerantz, 1981).

The idea of the perceptual Gestalt can be used to address the hazard perception of consumer products. In the experiments reported here, it was assumed by the experimenter that participants could distinguish two separate variables when assessing a

product package stimuli: the container shape and the color. However, according to a Gestalt approach, these variables may have been grouped into the single percept of “product package.” In the case of the product package stimuli, color was directly applied to the container shape; thus, by the law of proximity, the container shape and color were grouped together to form a “product package unit.” The perception of the product packages may have been further influenced by top-down processing. While the proximity of the container shape and color helped create a “bottom-up” representation of the product package, the concept of good figure would lead participants to apply top-down processing, where the goal of perception was a single, unitary object. Thus, color can be seen as indivisible from the container shape.

As stated earlier, a consequence of grouping is holistic processing. Therefore, the “product package unit” became relatively indivisible into its constituent components. This may help explain the difference in results between the “real” task in Experiment 4 and the “paper and pencil” task. When faced with actual product packages (the cans of paint stripper in Experiment 4), the participants may have viewed them as such; as discrete entities rather than as container shapes with different colors. However, when the participants were asked to compare all three product packages, the containers could be compared differentially based on color. Thus, at this point, color became important and could be “separated from the whole.” In other words, the participants may not have been evaluating the product packages as distinct entities, but rather, were evaluating the containers on what the colors of each container implied in terms of hazard.

This idea of holistic processing may have also been at work in Experiment 3. The analysis of the independent influence of color and container shape on precautionary intent indicated that neither of these variables appeared to have an effect of precautionary intent. While participants were not presented with actual product containers (physical objects) as they were in Experiment 4, they were presented with a complete “picture;” color applied to a container shape. Also, given that the participants knew the contents of the container, the participants may have viewed these “pictures” as discrete entities (a product package) rather than as a container shape that happened to be a particular color.

The question “how do you get consumers to consider relative hazard when making a purchasing decision” is an important one. More generally, if color is limited as a cue for signaling hazard, how can it be done? The experiments described here resulted in a series of product packages that are consistently associated with certain products. This information is of practical value to manufacturers. Given a particular product that exists on the market, there is some evidence that members of the public share a common experience of how that product is packaged. Manufacturers can take advantage of this information and use these expectations when designing the product package for new products.

The idea of a common experience among members of the public for consumer products essentially reduces the cues of container shape and color serve to surrogates for a more abstract representation of hazard. The general question here is whether there are characteristics about the product package that signal the contents and a certain level of hazard? Is it merely experience, the knowledge that “milk comes in a milk carton,” or are

there are any abstract principles that signal a certain product package as containing a hazardous product?

Returning to the Gestalt explanation, the question becomes: Is there a set of emergent features of the product package which signal the potential hazardousness of the enclosed product? One of the Gestalt questions of perception is how the parts of a unit are processed when they are presented in a context. The basic question here can be demonstrated with the following question: Which do we see first, the forest or the trees? One answer to this question is that when we are presented with a forest, we may not process ("see") the trees at all; rather, we process the *emergent features* of the forest, such as its density and texture (Pomerantz, 1981).

The same idea can be translated to product packages: consumers may see the product package, not the independent color and shape. Thus, a direction for future research would be to determine what emergent features of a product package consumers process, and use this information to establish a set of guidelines that assist manufacturers in designing product packages which signal certain hazards. One avenue would be to examine why products are already in the containers in which they are packaged. One of the simplest reasons products are put into particular containers is the method of dispensing. For example, most product packages make it obvious how the product is to be dispensed. In some cases, the method of dispensing controls use of the product. Consider a salad dressing bottle. Some bottles simply have a wide mouth the same size as the neck of the bottle. Others, however, have a filter which narrows the amount of product which can be dispensed at any one time. Thus, there may be other characteristics

inherent to the container that signal how the product is to be used and stored, and its hazards.

Another future direction of research would be to follow up on the idea of cost of compliance. While the cost of compliance was deliberately low in Experiment 4, it would be interesting to see if differences in cost of compliance influenced container choice and safety equipment selection. Many participants in Experiment 4 indicated anecdotally that they would not have used any safety equipment had it not been readily available. In other words, if they were actually buying paint stripper to use at home, they would not buy any safety equipment. An interesting line of research would be to determine what trade-offs participants would make in terms of time and safety. In other words, would a participant choose a less hazardous product knowing it may take longer to work if no safety equipment is available. Similarly, would a participant choose a more hazardous product that worked faster if safety equipment were available?

Consumers seem to “know” that they should use safety equipment, however, in many instances, they elect not to. This is usually justified with “I’ll be careful.” This idea of “being careful” is based on a long history of benign experience with most household products. However, the situation described earlier regarding the use of seatbelts bears mentioning once again. Slovic (1980) suggested that people are unlikely to use a seatbelt on any one particular car trip because the likelihood of an accident is extremely low for any one trip. However, if the perspective is changed to one of a lifetime of driving, the likelihood of an accident increases. The same issue needs to be addressed with consumer products. Much of the previous research on consumer safety

seems to focus on single-use instances of a consumer product. However, the perceptions of hazard may change when product use is viewed over the long term, thereby influencing the amount of precaution taken at every instance of use. For example, it is probably not particularly hazardous to smoke one cigarette. However, it is a lifetime of smoking cigarettes that results in various health conditions. This approach of the long view should be taken with consumer products; hazard should not be assessed for simply the single-use case, but over the long-term history of use.

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APPENDIX A
EXPERIMENT 1 MATERIALS

APPENDIX A-1

SCENARIOS FROM EXPERIMENT 1 - LABELED FOR PRODUCT TYPE AND
HAZARD LEVEL

Product Packaging Scenario 1: Household Surface Cleaner; Slightly Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of household surface cleaner. This product cleans and disinfects household surfaces, including counter tops, mirrors, vinyl floors, sinks/tubs, and toilets. This new product can cause eye and skin irritation if it comes into contact with these areas. It may also result in mild poisoning if swallowed and may result in lightheadedness if inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a minor injury requiring at-home first aid. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 2: Household Surface Cleaner; Moderately Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of household surface cleaner. This product cleans and disinfects household surfaces, including counter tops, mirrors, vinyl floors, sinks/tubs, and toilets. This new product can cause eye and skin damage if it comes into contact with these areas. It may also result in poisoning if swallowed and may result in dizziness if inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 3: Household Surface Cleaner; Extremely Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of household surface cleaner. This product cleans and disinfects household surfaces, including counter tops, mirrors, vinyl floors, sinks/tubs, and toilets. This new product can cause third degree chemical burns if it comes into contact with the eyes or skin. It may also result in poisoning if swallowed and may cause fainting if inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and a long-term or permanent disability. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 4: Furniture Refinisher; Slightly Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of furniture refinisher. This product removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets. This new product is combustible. It can cause eye and skin irritation if it comes into contact with these areas. The product may be irritating if swallowed or inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a minor injury requiring at-home first aid. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 5: Furniture Refinisher; Moderately Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of furniture refinisher. This product removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets. This new product is combustible. It can cause eye and skin damage if it comes into contact with these areas. The product may be harmful if swallowed or inhaled over a long period of time. Exposure to some of the chemicals in the refinisher may cause reproductive harm to women who are pregnant. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and a short-term disability. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 6: Furniture Refinisher; Extremely Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of furniture refinisher. This product removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets. This new product is combustible. This new product can cause third degree chemical burns if it comes into contact with the eyes or skin. The product may be fatal if swallowed or inhaled over a prolonged period of time. Repeated and prolonged exposure could result in permanent brain and nervous system damage. Exposure to some of the chemicals in the refinisher may cause reproductive harm to women who are pregnant. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and resulting in long-term or permanent disability or death. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 7: Automotive Treatment; Slightly Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of automotive treatment. This product cleans fuel injectors and improves automobile gas mileage. This new product is combustible. It can cause eye and skin irritation if it comes into contact with these areas. The product may be irritating if swallowed or inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a minor injury requiring at-home first aid. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 8: Automotive Treatment; Moderately Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of automotive treatment. This product cleans fuel injectors and improves automobile gas mileage. This new product is combustible. It can cause eye and skin damage if it comes into contact with these areas. The product may be harmful if swallowed or inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and a short-term disability. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 9: Automotive Treatment; Extremely Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of automotive treatment. This product cleans fuel injectors and improves automobile gas mileage. This new product is combustible. This new product can cause third degree chemical burns if it comes into contact with the eyes or skin. The product may be fatal if swallowed or inhaled over a prolonged period of time. Tests with animals have shown that repeated and prolonged exposure could result in cancer. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and resulting in long-term or permanent disability or death. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 10: Concentrated Garden Pesticide; Slightly Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of concentrated garden pesticide. This product kills any insects that come into direct contact with it while preserving the plants upon which it is used. It can cause eye and skin irritation if it comes into contact with these areas. The product may be irritating if swallowed or inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a minor injury requiring at-home first aid. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 11: Concentrated Garden Pesticide; Moderately Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of concentrated garden pesticide. This product kills any insects that come directly into contact with it while preserving the plants upon which it is used. It can cause eye and skin damage if it comes into contact with these areas. The product may cause mild poisoning if swallowed or inhaled over a long period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and a short-term disability. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 12: Concentrated Garden Pesticide; Extremely Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of concentrated garden pesticide. This product kills any insects that come into direct contact with it while preserving the plants upon which it is used. This new product can cause third degree chemical burns if it comes into contact with the eyes or skin. The product may be fatal if swallowed or inhaled over a prolonged period of time. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and resulting in long-term or permanent disability or death. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 13: Wall-Treatment/Adhesive; Slightly Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of wall-treatment/adhesive. This product fills holes in drywall and serves as an adhesive layer for wallpaper. It can cause eye irritation if it comes into contact with the eyes. The product may be irritating if swallowed. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a minor injury requiring at-home first aid. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 14: Wall-Treatment/Adhesive; Moderately Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of wall-treatment/adhesive. This product fills holes in drywall and serves as an adhesive layer for wallpaper. It can cause eye damage if it comes into contact with the eyes. The product may be harmful if swallowed. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and a short-term disability. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

Product Packaging Scenario 15: Wall-Treatment/Adhesive; Extremely Hazardous

You are an employee at a leading industrial manufacturer. Your company has asked you to design a container for a new type of wall-treatment/adhesive. This product fills holes in drywall and serves as an adhesive layer for wallpaper. This new product can cause blindness if it comes into contact with the eyes. The product may be fatal if swallowed. Your job is to design a container that will signal to users the contents pose the above hazards and may contribute to a major injury requiring emergency room treatment and resulting in long-term or permanent disability or death. Because of a contract between your company and a subcontractor which packages your company's products, you have a limited set of container shapes and colors that can be used for the product packaging.

Before designing your container, please rate the product for the amount of hazard you feel it poses to the consumer. Make this response by circling the number on the provided scale on your answer sheet. Then, choose the container shape that best represents the product and its hazards. Write the letter of the container you have chosen in the space provided. Next, choose a color that best represents the product and its hazards and write the color name in the space provided.

APPENDIX A-2

SAMPLE CONTAINER SHAPE SET AND COLOR SET FROM EXPERIMENT 1

C

G

F

H

I

A

E

J

D

B

YELLOW

RED

WHITE

BLACK

ORANGE

BLUE

GREEN

APPENDIX A-3
RESPONSE SHEET FROM EXPERIMENT 1

Product Packaging Response Sheet

Scenario #

Hazard Level: Based on the information contained in the scenario about this product, how hazardous are the contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
Slightly Moderately Extremely
Hazardous Hazardous Hazardous

Product Package:

Container: _____ Color: _____

Scenario #

Hazard Level: Based on the information contained in the scenario about this product, how hazardous are the contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
Slightly Moderately Extremely
Hazardous Hazardous Hazardous

Product Package:

Container: _____ Color: _____

Scenario #

Hazard Level: Based on the information contained in the scenario about this product, how hazardous are the contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
Slightly Moderately Extremely
Hazardous Hazardous Hazardous

Product Package:

Container: _____ Color: _____

APPENDIX B
EXPERIMENT 2 MATERIALS

APPENDIX B-1

CONTAINER SHAPE STIMULI FROM EXPERIMENT 2

Container A

Container B

Container C

Container D

Container E

APPENDIX B-2
RESPONSE SHEET FROM EXPERIMENT 2

Product Packaging Response Sheet

Container # _____

Likely Contents: What type of product is most likely to be found in this container? If you feel there is more than one likely type of product, please list the product **most** likely to be found in the container shape, followed by the next most likely, etc. You may use brand names for products if you cannot think of a category name.

1. _____

2. _____

3. _____

Container # _____

Likely Contents: What type of product is most likely to be found in this container? If you feel there is more than one likely type of product, please list the product **most** likely to be found in the container shape, followed by the next most likely, etc. You may use brand names for products if you cannot think of a category name.

1. _____

2. _____

3. _____

Container # _____

Likely Contents: What type of product is most likely to be found in this container? If you feel there is more than one likely type of product, please list the product **most** likely to be found in the container shape, followed by the next most likely, etc. You may use brand names for products if you cannot think of a category name.

1. _____

2. _____

3. _____

APPENDIX C
EXPERIMENT 3 MATERIALS

APPENDIX C-1

PRODUCT PACKAGING STIMULI FROM EXPERIMENT 3

Product Package A

This product package contains a product that removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets.

Product Package B

This product package contains a product that cleans and disinfects household surfaces, including counter tops, mirrors, vinyl floors, sinks/tubs, and toilets.

Product Package C

This product package contains a product that removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets.

Product Package D

This product package contains a product that cleans fuel injectors and improves automobile fuel mileage.

Product Package E

This product package contains a product that cleans fuel injectors and improves automobile fuel mileage.

Product Package F

This product package contains a product that cleans fuel injectors and improves automobile fuel mileage.

Product Package G

This product package contains a product that kills any insects that come into contact with it while preserving the plants upon which it is used.

Product Package H

This product package contains a product that fills holes in drywall and serves as an adhesive layer for wallpaper.

Product Package I

This product package contains a product that removes sticky substances, old paint, and old polyurethane finishes from wooden indoor home furnishings such as tables, chairs, and cabinets.

Product Package J

This product package contains a product that fills holes in drywall and serves as an adhesive layer for wallpaper.

APPENDIX C-2
RESPONSE SHEET FROM EXPERIMENT 3

Product Packaging Response Sheet

Hazardous Contents: Based on the information about this product package, how hazardous are the contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Hazardous to Eat or Drink: Based on the information about this product package, how hazardous would it be to eat or drink its contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Hazardous to Inhale: Based on the information about this product package, how hazardous would it be to inhale its contents?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Hazardous Skin Contact: Based on the information about this product package, how hazardous would it be if its contents contacted the skin?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Hazardous to Children: Based on the information about this product package, how hazardous would its contents be to children?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Hazardous in Closed Spaces: Based on the information about this product package, how hazardous would it be to use its contents in a closed space (such as a closet)?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

Flammable/Combustible Hazard: Based on the information about this product package, how likely is it that the contents are flammable/combustible?

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Likely Likely Likely

Product Packaging Response Sheet

Precautionary Measures: Imagine that you must use the product in this product package. What types of precautionary measures would you take when using this product? Circle all responses that apply.

1. Read a Label
2. Wear Gloves
3. Wear Eye Protection (Goggles)
4. Wear an Apron
5. Wear a Breathing Mask

APPENDIX D
EXPERIMENT 4 MATERIALS

APPENDIX D-1

EQUIPMENT TABLE LAYOUT FOR EXPERIMENT 4

Equipment Table Layout

APPENDIX D-2
RESPONSE SHEET FROM EXPERIMENT 4

Product Packaging Response Sheet

Hazard Level: How hazardous are the contents of the container you selected? Please circle the number that corresponds to how hazardous you think the contents are.

0-----1-----2-----3-----4-----5-----6-----7-----8
Slightly Moderately Extremely
Hazardous Hazardous Hazardous

Container Chosen: Please write the letter of the container you selected. _____

Precautionary Measures: Please circle the letter corresponding to each of the pieces of safety equipment you picked up for use in the task.

- (a) gloves
- (b) safety glasses
- (c) coverall
- (d) breathing mask

Free Response: Please write a brief response explaining why you selected the container and safety equipment indicated above.

Product Packaging Response Sheet

Hazardous Contents: Please rate the degree to which you feel the contents of each container are hazardous based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Hazardous to Eat or Drink: Please rate the degree to which you feel the contents of each container are hazardous to eat or drink based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Hazardous to Inhale: Please rate the degree to which you feel the contents of each container are hazardous to inhale based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Product Packaging Response Sheet

Hazardous Skin Contact: Please rate the degree to which you feel the contents of each container are hazardous to have come into contact with the skin based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Hazardous to Children: Please rate the degree to which you feel the contents of each container are hazardous to children based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Hazardous in Closed Spaces: Please rate the degree to which you feel the contents of each container are hazardous to use in closed spaces (such as a closet) based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Hazardous Hazardous Hazardous

A. _____

B. _____

C. _____

Product Packaging Response Sheet

Flammable/Combustible Hazard: Please rate the degree to which you feel it is likely that the contents of each container are flammable/combustible based on the container's physical appearance. Please use the scale below to determine a rating for each container and place your response in the blank which corresponds to each container.

0-----1-----2-----3-----4-----5-----6-----7-----8
 Slightly Moderately Extremely
 Likely Likely Likely

A. _____

B. _____

C. _____

Precautionary Measures: Imagine that you must use the contents of each of the containers. What precautionary measures would you take for each of the containers? Please circle the letter corresponding to each of the safety equipment items you would wear if asked to use the contents of each container.

Container A

- (a) Gloves
- (b) Safety Glasses
- (c) Coverall
- (d) Breathing Mask

Container B

- (a) Gloves
- (b) Safety Glasses
- (c) Coverall
- (d) Breathing Mask

Container C

- (a) Gloves
- (b) Safety Glasses
- (c) Coverall
- (d) Breathing Mask

APPENDIX E
DATA AND ANALYSIS RESULTS FROM EXPERIMENT 1

APPENDIX E-1

ANOVA FOR EFFECT OF PRODUCT TYPE AND HAZARD LEVEL ON PRODUCT
HAZARD RATINGS

ANOVA**Tests of Between-Subjects Effects**

Dependent Variable: HAZRATE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1228.838	14	87.774	53.764	.000
Intercept	11564.193	1	11564.193	7083.411	.000
PRODUCT	88.281	4	22.070	13.519	.000
HAZVALUE	1111.486	2	555.743	340.409	.000
PRODUCT * HAZVALUE	29.686	8	3.711	2.273	.022
Error	702.007	430	1.633		
Total	13490.000	445			
Corrected Total	1930.845	444			

a. R Squared = .636 (Adjusted R Squared = .625)

Tukey HSD for pairwise comparisons of product type

Pairwise Comparisons

Dependent Variable: HAZRATE

(I) PRODUCT	(J) PRODUCT	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	-1.185	.192	.000	-1.563	-.807
	3	-.635	.191	.001	-1.010	-.259
	4	-.181	.192	.346	-.557	.196
	5	-5.441E-02	.192	.777	-.431	.322
2	1	1.185	.192	.000	.807	1.563
	3	.550	.192	.004	.174	.927
	4	1.004	.192	.000	.627	1.382
	5	1.131	.192	.000	.753	1.508
3	1	.635	.191	.001	.259	1.010
	2	-.550	.192	.004	-.927	-.174
	4	.454	.191	.018	7.858E-02	.829
	5	.580	.191	.003	.205	.956
4	1	.181	.192	.346	-.196	.557
	2	-1.004	.192	.000	-1.382	-.627
	3	-.454	.191	.018	-.829	-7.858E-02
	5	.126	.192	.510	-.250	.503
5	1	5.441E-02	.192	.777	-.322	.431
	2	-1.131	.192	.000	-1.508	-.753
	3	-.580	.191	.003	-.956	-.205
	4	-.126	.192	.510	-.503	.250

* The mean difference is significant at the .05 level.

Tukey HSD for pairwise comparisons of hazard level

Pairwise Comparisons

Dependent Variable: HAZRATE

(I) HAZVALUE	(J) HAZVALUE	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
.00	4.00	-1.715	.148	.000	-2.006	-1.423
	8.00	-3.868	.149	.000	-4.160	-3.576
4.00	.00	1.715	.148	.000	1.423	2.006
	8.00	-2.153	.148	.000	-2.444	-1.861
8.00	.00	3.868	.149	.000	3.576	4.160
	4.00	2.153	.148	.000	1.861	2.444

* The mean difference is significant at the .05 level.

Means and Standard Deviations

Descriptive Statistics

Dependent Variable: HAZRATE

PRODUCT	HAZVALUE	Mean	Std. Deviation	N
1	.00	2.9333	1.3880	30
	4.00	4.8621	1.3816	29
	8.00	6.2667	1.2015	30
	Total	4.6854	1.9045	89
2	.00	3.8621	1.3018	29
	4.00	6.1000	1.4468	30
	8.00	7.6552	.5526	29
	Total	5.8750	1.9406	88
3	.00	3.7000	1.1492	30
	4.00	4.9667	1.4967	30
	8.00	7.3000	1.1492	30
	Total	5.3222	1.9593	90
4	.00	2.9333	.9803	30
	4.00	4.5333	1.4794	30
	8.00	7.1379	1.1252	29
	Total	4.8427	2.1100	89
5	.00	2.7586	1.2721	29
	4.00	4.3000	1.6220	30
	8.00	7.1667	1.2341	30
	Total	4.7640	2.2914	89
Total	.00	3.2365	1.2903	148
	4.00	4.9530	1.5953	149
	8.00	7.1014	1.1649	148
	Total	5.0966	2.0854	445

NOTE TO USERS

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APPENDIX E-2

BAR GRAPHS OF CONTAINER SHAPE AND COLOR SELECTION BY PRODUCT
TYPE

Figure E1. Percentage of respondents selecting each container shape for household surface cleaner scenarios.

Figure E2. Percentage of respondents selecting each color for household surface cleaner scenarios.

Figure E3. Percentage of respondents selecting each container shape for furniture refinisher scenarios.

Figure E4. Percentage of respondents selecting each color for furniture refinisher scenarios.

Figure E5. Percentage of respondents selecting each container shape for automotive treatment scenarios.

Figure E6. Percentage of respondents selecting each color for automotive treatment scenarios.

Figure E7. Percentage of respondents selecting each container shape for concentrated garden pesticide scenarios.

Figure E8. Percentage of respondents selecting each color for concentrated garden pesticide scenarios.

Figure E9. Percentage of respondents selecting each container shape for wall-treatment/adhesive scenarios.

Figure E10. Percentage of respondents selecting each color for wall-treatment/adhesive scenarios.

APPENDIX F
DATA AND ANALYSIS RESULTS FROM EXPERIMENT 2

APPENDIX F-1

BAR GRAPHS OF LIKELY PRODUCT TYPE BY CONTAINER SHAPE

Product Types Likely to Be Found in Container A

Figure F1. Percentage of respondents identifying product types likely to be found in Container A. Percentages may add up to more than 100 percent as participants were encouraged to identify more than one likely product type for each container.

Figure F2. Percentage of respondents identifying product types likely to be found in Container B. Percentages may add up to more than 100 percent as participants were encouraged to identify more than one likely product type for each container.

Product Types Likely to Be Found in Container C

Figure F3. Percentage of respondents identifying product types likely to be found in Container C. Percentages may add up to more than 100 percent as participants were encouraged to identify more than one likely product type for each container.

Product Types Likely to Be Found in Container D.

Figure F4. Percentage of respondents identifying product types likely to be found in Container D. Percentages may add up to more than 100 percent as participants were encouraged to identify more than one likely product type for each container.

Product Types Likely to Be Found in Container E.

Figure F5. Percentage of respondents identifying product types likely to be found in Container E. Percentages may add up to more than 100 percent as participants were encouraged to identify more than one likely product type for each container.

APPENDIX G
DATA AND ANALYSIS RESULTS FROM EXPERIMENT 3

APPENDIX G-1

FACTOR ANALYSIS FOR THE SEVEN HAZARD RATING SCALES

Descriptive Statistics

	Mean	Standard Deviation
Contents	4.7167	1.8532
Eat	6.6233	1.4544
Inhale	4.8133	2.1261
Skin	4.2900	2.1683
Child	5.9833	1.7739
Closed Space	4.3467	2.3002
Flame	5.2367	2.4510

Correlation Matrix

	Contents	Eat	Inhale	Skin	Child	Closed Space	Flame
Contents	1.00	.640	.753	.740	.738	.663	.557
Eat	.640	1.000	.533	.458	.608	.462	.443
Inhale	.753	.533	1.000	.728	.652	.694	.632
Skin	.740	.458	.728	1.000	.746	.634	.469
Child	.738	.608	.652	.746	1.000	.637	.417
Closed Space	.663	.462	.694	.634	.637	1.000	.640
Flame	.557	.443	.632	.469	.417	.640	1.000

Communalities

	Initial	Extraction
Contents	1.00	.801
Eat	1.00	.509
Inhale	1.00	.770
Skin	1.00	.710
Child	1.00	.712
Closed Spaces	1.00	.685
Flame	1.00	.512

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.699	67.126	67.126	4.699	67.126	67.126
2	.707	10.099	77.225			
3	.593	8.470	85.695			
4	.337	4.813	90.508			
5	.256	3.659	94.167			
6	.215	3.074	97.241			
7	.193	2.759	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
Contents	.895
Inhale	.877
Child	.844
Skin	.842
Closed Spaces	.828
Flame	.715
Eat	.713

APPENDIX G-2

ANOVA FOR EFFECT OF PRODUCT PACKAGE STIMULI ON AMOUNT OF
PRECAUTIONARY INTENT

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	122.523	9	13.614	22.371	.000
Within Groups	176.477	290	.609		
Total	299.000	299			

Tukey HSD for Multiple Comparisons of Product Package Stimuli

(I) CONTAIN# (J) CONTAIN#	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
1.00 2.00	1.1852629	.201	.000	.5480374	1.8224884
1.00 3.00	3.915623E-02	.201	1.000	-.5980693	.6763817
1.00 4.00	.2276870	.201	.982	-.4095385	.8649125
1.00 5.00	7.415615E-02	.201	1.000	-.5630693	.7113816
1.00 6.00	.2255042	.201	.983	-.4117213	.8627297
1.00 7.00	.4741296	.201	.354	-.1630959	1.1113551
1.00 8.00	1.7727698	.201	.000	1.1355443	2.4099953
1.00 9.00	.1107738	.201	1.000	-.5264517	.7479993
1.00 10.00	1.5449853	.201	.000	.9077598	2.1822108
2.00 1.00	-1.1852629	.201	.000	-1.8224884	-.5480374
2.00 3.00	-1.1461067	.201	.000	-1.7833322	-.5088812
2.00 4.00	-.9575759	.201	.000	-1.5948014	-.3203504
2.00 5.00	-1.1111068	.201	.000	-1.7483323	-.4738813
2.00 6.00	-.9597587	.201	.000	-1.5969842	-.3225333
2.00 7.00	-.7111333	.201	.015	-1.3483588	-.0739078
2.00 8.00	.5875069	.201	.101	-.04971863	1.2247323
2.00 9.00	-1.0744892	.201	.000	-1.7117146	-.4372637
2.00 10.00	.3597224	.201	.744	-.2775031	.9969479
3.00 1.00	-.03915623	.201	1.000	-.6763817	.5980693
3.00 2.00	1.1461067	.201	.000	.5088812	1.7833322
3.00 4.00	.1885308	.201	.995	-.4486947	.8257563
3.00 5.00	.0349999	.201	1.000	-.6022256	.6722254
3.00 6.00	.1863480	.201	.996	-.4508775	.8235734
3.00 7.00	.4349734	.201	.485	-.2022521	1.0721989
3.00 8.00	1.7336136	.201	.000	1.0963881	2.3708390
3.00 9.00	.07161752	.201	1.000	-.5656079	.7088430
3.00 10.00	1.5053291	.201	.000	.8686036	2.1430546
4.00 1.00	-.2276870	.201	.982	-.8649125	.4095385
4.00 2.00	.9575759	.201	.000	.3203504	1.5948014
4.00 3.00	-.1885308	.201	.995	-.8257563	.4486947
4.00 5.00	-.1535309	.201	.999	-.7907564	.4836946
4.00 6.00	-.0218285	.201	1.000	-.6394083	.6350426
4.00 7.00	.2464426	.201	.969	-.3907829	.8836681
4.00 8.00	1.5450827	.201	.000	.9078573	2.1823082
4.00 9.00	-.1169133	.201	1.000	-.7541388	.5203122
4.00 10.00	1.3172983	.201	.000	.6800728	1.9545238

5.00	1.00	-.07415615	.201	1.000	-.7113816	.5630693
	2.00	1.1111068	.201	.000	.4738813	1.7483323
	3.00	-.03499992	.201	1.000	-.6722254	.6022256
	4.00	.1535309	.201	.999	-.4836946	.7907564
	6.00	.1513480	.201	.999	-.4858775	.7885735
	7.00	.3999735	.201	.609	-.2372520	1.0371990
	8.00	1.6986136	.201	.000	1.0613881	2.3358391
	9.00	.03661762	.201	1.000	-.6006079	.6738431
	10.00	1.4708292	.201	.000	.8336037	2.1080547
6.00	1.00	-.2255042	.201	.983	-.8627297	.4117213
	2.00	.9597587	.201	.000	.3225333	1.5969842
	3.00	-.1863480	.201	.996	-.8235734	.4508775
	4.00	.02182855	.201	1.000	-.6350426	.6394083
	5.00	-.1513480	.201	.999	-.7885735	.4858775
	7.00	.2486254	.201	.967	-.3886000	.8858509
	8.00	1.5472656	.201	.000	.9100401	2.1844911
	9.00	-.1147304	.201	1.000	-.7519559	.5224951
	10.00	1.3194811	.201	.000	.6822556	1.9567066
7.00	1.00	-.4741296	.201	.354	-1.1113551	.1630959
	2.00	.7111333	.201	.015	.07390782	1.3483588
	3.00	-.4349734	.201	.485	-1.0721989	.2022521
	4.00	-.2464426	.201	.969	-.8836681	.3907829
	5.00	-.3999735	.201	.609	-1.0371990	.2372520
	6.00	-.2486254	.201	.967	-.8858509	.3886000
	8.00	1.2986402	.201	.000	.6614147	1.9358656
	9.00	-.3633559	.201	.733	-1.0005813	.2738696
	10.00	1.0708557	.201	.000	.4336302	1.7080812
8.00	1.00	-1.7727698	.201	.000	-2.4099953	-1.1355443
	2.00	-.5875069	.201	.101	-1.2247323	.04971864
	3.00	-1.7336136	.201	.000	-2.3708390	-1.0963881
	4.00	-1.5450827	.201	.000	-2.1823082	-.9078573
	5.00	-1.6986136	.201	.000	-2.3358391	-1.0613881
	6.00	-1.5472656	.201	.000	-2.1844911	-.9100401
	7.00	-1.2986402	.201	.000	-1.9358656	-.6614147
	9.00	-1.6619960	.201	.000	-2.2992215	-1.0247705
	10.00	-.2277845	.201	.982	-.8650100	.4094410
9.00	1.00	-.1107738	.201	1.000	-.7479993	.5264517
	2.00	1.0744892	.201	.000	.4372637	1.7117146
	3.00	-.07161754	.201	1.000	-.7088430	.5656079
	4.00	.1169133	.201	1.000	-.5203122	.7541388
	5.00	-.03661761	.201	1.000	-.6738431	.6006079
	6.00	.1147304	.201	1.000	-.5224951	.7519559
	7.00	.3633559	.201	.733	-.2738696	1.0005813
	8.00	1.6619960	.201	.000	1.0247705	2.2992215
	10.00	1.4342115	.201	.000	.7969861	2.0714370
10.00	1.00	-1.5449853	.201	.000	-2.1822108	-.9077598
	2.00	-.3597224	.201	.744	-.9969479	.2775031
	3.00	-1.5058291	.201	.000	-2.1430546	-.8686036
	4.00	-1.3172983	.201	.000	-1.9545238	-.6800728
	5.00	-1.4708292	.201	.000	-2.1080547	-.8336037
	6.00	-1.3194811	.201	.000	-1.9567066	-.6822556
	7.00	-1.0708557	.201	.000	-1.7080812	-.4336302
	8.00	.2277845	.201	.982	-.4094410	.8650100
	9.00	-1.4342115	.201	.000	-2.0714370	-.7969861

* The mean difference is significant at the .05 level.

APPENDIX G-3
ANOVA FOR EFFECT OF COLOR OR CONTAINER SHAPE ON
PRECAUTIONARY INTENT

ANOVA for effect of color on precautionary intent for Containers A, C, and I

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.289	2	.144	.134	.875
Within Groups	94.033	87	1.081		
Total	94.322	89			

ANOVA for effect of color on precautionary intent for Containers H and J

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.667	1	1.667	1.984	.164
Within Groups	48.733	58	.840		
Total	50.400	59			

ANOVA for effect of shape on precautionary intent for Containers E and F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.817	1	.817	.676	.414
Within Groups	70.033	58	1.207		
Total	70.850	59			

APPENDIX G-4

BAR GRAPHS OF PRECAUTIONARY INTENT BY PRODUCT PACKAGE
STIMULI

Figure G1. Percentage of respondents indicating individual intended precautionary behaviors for Container A.

Figure G2. Percentage of respondents indicating individual intended precautionary behaviors for Container B.

Figure G3. Percentage of respondents indicating individual intended precautionary behaviors for Container C.

Figure G4. Percentage of respondents indicating individual intended precautionary behaviors for Container D.

Figure G5. Percentage of respondents indicating individual intended precautionary behaviors for Container E.

Figure G6. Percentage of respondents indicating individual intended precautionary behaviors for Container F.

Figure G7. Percentage of respondents indicating individual intended precautionary behaviors for Container G.

Figure G8. Percentage of respondents indicating individual intended precautionary behaviors for Container H.

Figure G9. Percentage of respondents indicating intended precautionary behaviors for Container I.

Figure G10. Percentage of respondents indicating intended precautionary behaviors for Container J.

APPENDIX H

DATA AND ANALYSIS RESULTS FROM EXPERIMENT 4

APPENDIX H-1
ONE-WAY ANOVA FOR EFFECT OF HAZARD LEVEL MANIPULATION ON
SELECTED STIMULI CONTAINER

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups		15.042	2	7.521	4.644	.018
	Linear Term	15.042	1	15.042	9.288	.005
Within Groups		45.345	28	1.619		
Total		60.387	30			

Tukey HSD for Pairwise Comparisons of Hazard Levels

Hazard Value (i)	Hazard Value (j)	Mean Difference (i-j)	Std. Error	Sig.
Low	Moderate	-.7857	.605	.408
	High	-1.5833*	.520	.013
Moderate	Low	.7857	.605	.408
	High	-.7976	.605	.397
High	Low	1.5833*	.520	.013
	Moderate	.7976	.605	.397

* The mean difference is significant at the .05 level

Means and Standard Deviations

Hazard Level	N	Mean	Std. Deviation
Low	12	3.5000	1.6787
Moderate	7	2.2857	0.4880
High	12	5.0833	1.0836
Total	31	4.2903	1.4188

APPENDIX H-2
ONE-WAY ANOVA FOR EFFECT OF SELECTED CONTAINER ON
PRECAUTIONARY INTENT

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.277	2	.139	.208	.814
Within Groups	18.690	28	.668		
Total	18.968	30			

Tukey HSD for Multiple Comparisons of Selected Containers

Hazard Value (i)	Hazard Value (j)	Mean Difference (i-j)	Std. Error	Sig.
Low	Moderate	.2262	.389	.831
	High	.1667	.334	.872
Moderate	Low	-.2262	.389	.831
	High	-.0595	.389	.987
High	Low	-.1667	.334	.872
	Moderate	.0595	.389	.987

Means and Standard Deviations

Hazard Level	N	Mean	Std. Deviation
Low	12	3.0833	.7930
Moderate	7	2.8571	.8997
High	12	2.9167	.7930
Total	31	2.9677	.7951

APPENDIX H-3

BAR GRAPH OF SELECTED SAFETY EQUIPMENT BY SELECTED STIMULUS
CONTAINER

Figure H1. Percentage of respondents selecting individual items of safety equipment for chosen container.

APPENDIX H-4
RAW DATA RESPONSES TO OPEN-ENDED QUESTION ON CONTAINER AND
SAFETY EQUIPMENT SELECTION

Participant	Container Selected	Comment
1	A	Picked safety equipment because ignorant of container contents and figured better to take excessive precautions than not enough.
2	C	White container looked professional, where red and yellow looked flashy. Thought white would do better job; be stronger, quicker, etc. If strong, probably also dangerous, so took gloves, and coverall to protect self and breathing mask. Didn't take goggles because already wear glasses.
3	B	Didn't know anything about what in each container, so picked first one on left (B). Gloves seemed like good idea, since working with hands and touching paint remover. Mask in case fumes too strong.
4	B	Selected B because figured would be more hazardous but faster than C. Figured A would be most hazardous and didn't want to take risk for faster results. Figured C would be too slow. Picked gloves to keep solvent off hands and mask to avoid smell of the solvent.
5	C	White container had less danger apparently; white coloring historically is indicative of peace and safety. Took all safety equipment because paint stripper is nasty stuff.
6	A	Red container seemed most familiar; usually hazardous materials packaged in red. Since I knew that all or some of the containers contained hazardous materials, went ahead and picked up all the safety equipment. The others seemed like they would be less hazardous (due to packaging), but didn't choose them because were unfamiliar.
7	A	Chose red container because chance that I might select one that would take me longer to complete the job. Figured if it's more "dangerous," then I'll finish the job faster and I felt that the red container held the "stronger" or more hazardous liquid. Chose the gloves, safety glasses, and breathing mask so would not put myself in danger when handling the toxic liquid.

8	C	Based on color, containers looked as if they were in order according to potential hazard. In general, red may mean dangerous; yellow is caution and white just seemed safer (took C). Took gloves and breathing mask to protect myself from harmful fumes and chemicals that could affect my skin.
9	A	Took A because it was red. White was too "clean" so it might be a trick, and I don't like the color yellow. Took gloves to protect hands, safety glasses in case any stripper splattered upwards, coverall to protect clothes and legs, and breathing mask because it might cut back on fume intake.
10	A	Chose red container because associated color with strength of paint stripper. Since didn't want to wait long for paint to come off, chose what I thought to be strongest of three. Expected that A would also be most hazardous, so chose gloves, safety glasses, and mask. Took coverall to protect skin that was showing. Wanted to be as cautious as possible Since paint stripper was most potent.
11	C	Of the 3 colors, white appeared to be the least associated with hazard. Red and yellow appeared to be more dangerous, and seeing that I wasn't told about each container's specific hazardousness, I felt compelled to choose the least apparently dangerous or hazardous/toxic container. Wanted to protect hands and so chose gloves. Breathing mask would stifle fumes and any small particles from refinishing.
12	C	Compared to other containers, which were colored in bright striking colors (bright red and yellow), white seemed to be least harmful. I suppose the white color gave me that idea. It seemed as if the other two had to "advertise" themselves just in order to get picked.
13	C	Picked container arbitrarily. Gloves were so that I wouldn't stain my hands, the coverall was for my clothes, the mask was so I wouldn't inhale any noxious fumes.
14	A	No specific reason to pick container; thought maybe red was faster. Picked all the safety equipment that was available. Didn't really know what the task entailed; better safe than sorry. Knew the varnish was somewhat dangerous.

15	B	Chose middle container because assumed it was going to work better than container A yet be less dangerous than container C. Chose the safety equipment because don't want to injury myself. Chose safety glasses in case there would be work that had risk of splattering chemicals, though may or may not have used them. Chose coverall because wanted to protect my clothes. Chose breathing mask because take special care of voice and lungs.
16	C	Selected container C because it was the first one and other than the color, couldn't tell any difference so I just chose the closest one. I chose the gloves because the stuff in the container may be hazardous, so it might irritate skin. Chose breathing mask because of same reason; I thought the material might be carcinogenic and paint usually smells bad anyway. Chose the safety glasses in case the process might cause debris to fly and be hazardous to my eyes. Since I have no experience with this task, I didn't know if that would happen or not, so I decided just to be cautious.
17	B	I selected the yellow can because the red looked too dangerous but the white looked too weak. Selected all the safety equipment except for the coverall because I figured I would be careful and not spill any on myself.
18	A	I selected the red container, A, because it looked the nicest. The other 2 colors just looked older. I chose gloves because my hands are very sensitive to chemicals and I didn't know how dangerous the product was. I chose a breathing mask so as not to breathe in the fumes. I chose safety glasses to protect my eyes.
19	B	The red indicated some sort of hazard (in general, red does). So the yellow seemed like a "less hazardous" choice. I picked the mask because if paint thinner probably has yucky fumes and the gloves so it didn't get all over my hands.
20	A	I selected the red container, A, partially because red is a color I like and partially because red is a strong color so I figured whoever had packaged it wanted that to be relatively clear.

21	A	I like to get something done quickly, and if it's a consumer product, it can't be too hazardous. Typically, red is associated with hazardous materials, so it will probably work the fastest. Chose gloves because it's hazardous and could cause allergic reactions with skin contact, so I protected my hands. Also, paint thinner has pretty strong fumes, so the mask protects my lungs.
22	C	Selected the container I did because it was white. The other two were red and yellow respectively. I think I chose the white one because it looked "safer" (less hazardous) than the other two. I chose the rest of the safety equipment because I never stripped paint from furniture so I took everything available to cover anything that I would have needed.
23	A	Selected the middle container as the most likely mix between the level of danger and the time the chemical would take to work. I chose the gloves and mask to protect myself from fumes and possible skin problems due to prolonged exposure. In retrospect, I should have chosen the glasses as well, but I generally don't like wearing safety glasses unless I know for certain that there is a need.
24	B	I know that turpentine or paint thinner has harmful fumes so I chose the breathing mask to avoid to much exposure to the fumes. I picked up the gloves to use to prevent chemical abrasions to my hands Since I'd be wiping the paint off. And I wanted the glasses as well to protect my eyes from splashes of chemicals. I thought hard about the coverall and didn't choose it because it is an experiment and I didn't want to put it on. However, I would have chosen it if I was a real worker.
25	A	Picked container A; it was red, assumed it was more volatile. Gloves to protect for hands. Use mask to prevent inhaling too much of stripper.
26	B	Thought color yellow was interesting. One needs breathing mask for fumes. And safety glasses are needed for particles in the air that result from stripping. Gloves are needed because everyone knows paint thinner is really toxic. So, you would use a coverall to protect your clothes.

27	C	I chose the white container most likely because of its fairly neutral color - yellow and especially red would indicate some reason to be a little wary of the container. I chose the gloves because when working with something even slightly hazardous it would be necessary to have them. Safety glasses - just one of those things they're taught you to wear when using anything chemical. Breathing mask - my first thought associated with paint stripper was fumes so that seemed a necessary piece of equipment.
28	C	I picked container C, the white container somewhat arbitrarily, however, I think the fact that it was white influenced me. It doesn't seem as potent as the red one, even if it would take me longer to get the paint off with C. I think it would be safer. I wanted the gloves in case I spilled some (I need my hands!) and the breathing mask because the fumes might be pretty bad.
29	C	I've never stripped paint so I wanted to be totally prepared for any problems I might run into (why I picked up all of the safety equipment). I selected Container C because it seemed to be the most realistic looking chemical container (I thought the other two were decoys)
30	C	I selected the container because the color of it suggested that while stronger looking than the yellow, it seemed less hazardous than the red. I picked the gloves and glasses so I didn't get chemicals on my hands and eyes. And I picked the breathing mask so I didn't have to inhale the fumes.
31	A	The container was red - usually meaning that contents are hazardous. It seems like these hazardous contents might work faster than less potent chemicals. Since the work involves hazardous materials, I chose protective things such as heavy gloves, goggles, and a breathing mask.

APPENDIX H-5
FACTOR ANALYSIS FOR THE SEVEN HAZARD RATING SCALES

Descriptive Statistics

	Mean	Standard Deviation
Contents	4.3978	2.0438
Eat	6.6882	1.5179
Inhale	5.6022	1.8774
Skin	4.4839	1.8859
Child	6.4301	1.5421
Closed Space	5.5591	1.5774
Flame	5.7204	1.9636

Correlation Matrix

	Contents	Eat	Inhale	Skin	Child	Closed Space	Flame
Contents	1.000	.415	.688	.804	.531	.567	.548
Eat	.415	1.000	.582	.327	.685	.546	.510
Inhale	.688	.582	1.000	.690	.608	.623	.536
Skin	.804	.327	.690	1.000	.477	.606	.527
Child	.531	.685	.608	.477	1.000	.450	.428
Closed Space	.567	.546	.623	.606	.450	1.000	.483
Flame	.548	.510	.536	.527	.428	.483	1.000

Communalities

	Initial	Extraction
Contents	1.00	.699
Eat	1.00	.529
Inhale	1.00	.750
Skin	1.00	.664
Child	1.00	.568
Closed Spaces	1.00	.603
Flame	1.00	.525

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.338	61.974	61.974	4.338	61.974	61.974
2	.890	12.710	74.684			
3	.566	8.089	82.773			
4	.507	7.243	90.016			
5	.296	4.228	94.244			
6	.233	3.334	97.578			
7	.170	2.422	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
Inhale	.866
Contents	.836
Skin	.815
Closed Spaces	.777
Child	.754
Eat	.727
Flame	.725

APPENDIX H-6

ONE-WAY ANOVA FOR EFFECT OF HAZARD LEVEL MANIPULATION ON
HAZARD RATINGS ACROSS THE STIMULI EVALUATIONS

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups		60.912	2	30.456	23.010	.000
	Linear Term	60.580	1	60.580	45.769	.000
Within Groups		119.123	90	1.324		
Total		180.035	92			

Tukey HSD for Pairwise Comparisons of Hazard Level

Hazard Value (i)	Hazard Value (j)	Mean Difference (i-j)	Std. Error	Sig.
Low	Moderate	-.8618*	.292	.011
	High	-1.9770*	.292	.000
Moderate	Low	.8618*	.292	.011
	High	-1.1152*	.292	.001
High	Low	1.9770*	.292	.000
	Moderate	1.1152*	.292	.001

* The mean difference is significant at the .05 level

Means and Standard Deviations

Hazard Level	N	Mean	Std. Deviation
Low	31	6.5853	1.2247
Moderate	31	5.4700	.8461
High	31	4.6083	1.3248
Total	93	5.5545	1.3989

APPENDIX H-7

ONE-WAY ANOVA FOR EFFECT OF HAZARD LEVEL MANIPULATION ON
PRECAUTIONARY INTENT

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups		11.892	2	5.946	8.623	.000
	Linear Term	11.758	1	11.758	17.050	.000
Within Groups		62.065	90	.690		
Total		73.957	92			

Tukey HSD for Pairwise Comparisons of Hazard Level

Hazard Value (i)	Hazard Value (j)	Mean Difference (i-j)	Std. Error	Sig.
Low	Moderate	-.5161*	.211	.043
	High	-.8710*	.211	.000
Moderate	Low	.5161*	.211	.043
	High	-.3548	.211	.218
High	Low	.8710*	.211	.000
	Moderate	.3548	.211	.218

* The mean difference is significant at the .05 level

Means and Standard Deviations

Hazard Level	N	Mean	Std. Deviation
Low	31	2.5161	.8896
Moderate	31	3.0323	.7521
High	31	3.3871	.8437
Total	93	2.9785	.8966

APPENDIX H-8

BAR GRAPHS OF PRECAUTIONARY MEASURES BY CONTAINER STIMULUS

Figure H2. Percentage of respondents selecting individual items of safety equipment for Container A.

Figure H3. Percentage of respondents selecting individual items of safety equipment for Container B.

Figure H4. Percentage of respondents selecting individual items of safety equipment for Container C.

IMAGE EVALUATION TEST TARGET (QA-3)

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