Effects of Warnings on Responsibility Allocation

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ABSTRACT

Four experiments explored the effects of warnings on people's allocation of responsibility for product safety. Participants read descriptions of accident scenarios in which injuries occurred during the use of products. They then allocated responsibility to the manufacturer, retailer, or consumer (user). Results of two experiments indicated more responsibility was assigned to the consumer and less to the manufacturer when products were accompanied by a warning (76%–94% to the consumer), compared to a no-warning condition (41%–68%). A third experiment compared responsibility allocations for good versus poor warnings. Consumers were assigned more responsibility (83%) with good warnings than with poor warnings (69%). The fourth experiment again showed warnings played a significant role in the allocations, but injury severity did not. Interactions in all four experiments indicated the role of warnings in responsibility allocations was less for products where the hazards are more obvious. In addition to implications for product safety, the results provide insights into jury decision making regarding the role of warnings in product liability litigation.

This article presents the results of a series of experiments carried out to explore how warnings influence people's allocation of responsibility

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for safety during consumer product use. Perceived responsibility is an important concern in safety. If a manufacturer perceives that the consumer of its product is primarily responsible for safety during use, it may give less attention to safety concerns. On the other hand, if the consumer perceives the manufacturer to be more responsible, he or she may exercise less care or caution when using the product. In either case, false perceptions of this sort may lead to more accidents, injuries, and property damage.

In addition to its implications for safety during product use, the allocation of safety responsibility is an important factor in understanding jury decision making in product liability litigation. Warnings have been a significant issue in such litigation in recent years, and juries are often charged with taking into account the availability and quality of warnings in allocating responsibility for an accident/injury to various parties.

There are several entities that might be considered candidates for such responsibility (Laughery, Lovvoll, & Wogalter, 1995). Manufacturers must consider safety during design as well as in the manufacture and marketing of a product. Distributors and retailers have a responsibility for ensuring that safety information and materials are passed on to users. The user, of course, has responsibilities for safety during use. In some circumstances there may be other entities involved. For example, where products are being used by employees in the work environment, employers may share responsibility for safe use (Lovvoll, Laughery, McQuilkin, & Wogalter, 1996). Another example would be parents, who have supervisory responsibility for children using products (Laughery, Lovvoll, & McQuilkin, 1996).

Several recent studies have reported results regarding responsibility allocation for safety during consumer product use. Laughery et al. (1995) found that manufacturers, retailers, and users were allocated 50%, 20%, and 30%, respectively, across a variety of products. They further noted that the allocation differed for different products, with users being assigned greater responsibility for more hazardous products and for products where the hazards are more open and obvious. Lovvoll et al. (1996) reported a study in which responsibility was examined for products used in work settings. The allocations were 41%, 11%, 22%, and 26% for manufacturers, distributors, employers, and employees (users), respectively. These allocations varied for different products as a function of how open and obvious the hazards are. The more obvious the hazard, the more responsibility is assigned to the user, whereas the manufacturer is assigned less. A third study (Laughery et al., 1996) examined allocation of responsibility for child safety in product use. The described age of the child was manipulated as a variable. Results showed that across a variety of products and child ages manufacturers were assigned 40% of the responsibility and retailers 12%. The remaining 48% was allocated to parents and children, with the child's responsibility increasing linearly from age 2 to 18 and the parent's responsi-

bility decreasing correspondingly. These studies begin to paint a picture of how people think about and allocate responsibility for product safety. Manufacturers typically are allocated 40%–50% and users 30%–50% (if one considers combinations of employer–employee and parent–child as users). Further, one of the variables that influence such allocations is the obviousness of the product hazards, with greater obviousness leading to higher allocations of user responsibility.

Two additional variables that might be expected to influence responsibility allocations are the presence or absence of product warnings and the severity of injury. The hypothesis regarding warnings is that when warnings are present, more responsibility will be assigned to users and less to manufacturers. Expectations regarding injury severity effects on responsibility allocation, however, are less definitive. If one assumes that injury severity is a factor in perceived hazardousness, the results reported by Laughery et al. (1995) would lead one to predict that higher severity will result in greater responsibility allocated to users. One might also expect a sympathy factor and/or the view that where products can lead to more severe injuries the manufacturer must exercise more care and take more responsibility. Studies reported in the social psychology literature have produced mixed results on the injury severity factor in responsibility allocation. For example, Kanekar and Pinto (1990) reported that greater severity associated with an incident led to less responsibility assigned to the individual involved. LaDoux, Fish, and Mosatche (1989), on the other hand, found no effect of outcome severity on responsibility allocation. Neither of these studies, however, involved product use.

The methodology employed in the studies reported here differs somewhat from the procedures used in the earlier studies by Laughery et al. (1995), Laughery et al. (1996), and Lovvoll et al. (1996). In those studies, familiar products were identified by name only. In the present research, scenarios are presented describing an accident in which a person is injured while using a product. The purpose of using scenarios was to increase the level of detail about the incident, to reduce variability in what the participants consider, and to increase the realism and external validity.

EXPERIMENT

Method

A questionnaire was employed in which participants allocated responsibility for the outcomes of accidents involving the use of products. Responsibility could be assigned to the manufacturer, the retailer, and/or the consumer (user). Scenarios describing the use of the products, the accidents, and the nature of the injuries/damages were presented. Eight

different scenarios involving eight different products were employed. It should be noted that circumstances may exist where entities in addition to or instead of the manufacturer, retailer, and consumer (the "agent" variable) could be assigned responsibility. Examples would be parents for products used by children, physicians for prescription medications, and employers for products used in the workplace. In this study, products and scenarios were selected so as to exclude such circumstances.

Participants. Twenty-nine students enrolled in introductory psychology courses at Rice University participated. There were 19 men and 10 women. The mean age was 20, with a range of 17–24.

Materials and Procedures. The questionnaire consisted of two parts. Part 1 contained two demographic items, age and gender. Part 2 presented eight different accident scenarios and with each scenario a list of the entities to which responsibility for the accident could be assigned. These entities were the manufacturer, the retailer, and the consumer. Most scenarios gave specific names of products (in some cases, actual brands), manufacturers, retailers, and consumers to provide realism to the events described. An example of the responsibility allocation portion of the questionnaire for one of the scenarios (involving the use of ibuprofen) is shown below. The numbers assigned must total 100.

PRODUCT: IBUPROFEN

Who is responsible for this accident?

The company (Healthix) that manufactured the ibuprofen	____
The store (Safmart) that sold it	____
The consumer (Janet Williams) who used it	____
	100%

The first column of Table 1 identifies the eight products involved in the scenarios. Two different versions of each scenario were used to manipulate the warning variable; one version had a warning and one did not. An example of a warning scenario, for ibuprofen, follows:

> Janet Williams, a 27-year-old married woman, was pregnant. The pregnancy had progressed normally with no complications. At a point $8\frac{1}{2}$ months into the pregnancy she had some serious pain with a tooth that had a cracked filling. She decided not to have the filling replaced until after the baby was born. In the meantime, she purchased a bottle of ibuprofen tablets from Safmart Drug Store to help relieve the pain. The ibuprofen is an over-the-counter pain relief medication manufactured

Table 1. Percent Responsibility Allocated to Consumer and Manufacturer for Warning and No Warning Conditions

	Consumer		Manufacturer	
Product	Warning	No Warning	Warning	No Warning
Fertilizer	92	43	3	54
Power saw	82	55	10	40
Gas grill	96	83	3	18
Ax	98	93	1	7
Ibuprofen	91	51	3	46
Gas can	98	88	2	12
Sun tan lotion	95	51	4	49
Hair spray	98	82	2	18
Mean	*94*	*68*	*4*	*31*

by Healthix Corp. She took the pills for three days and the toothache subsided. Four days later the baby was born and was severely mentally retarded. The cause of the retardation and early birth was linked to the use of the ibuprofen that late in the pregnancy. It had an adverse effect on the kidney of the unborn fetus, which in turn led to an oxygen deficiency and brain damage. The following warning was on the label of the ibuprofen:

⚠ WARNING

DO NOT use this medication if in the third trimester of pregnancy. Severe damage, including retardation, to the unborn child may result.

For the no-warning condition, the above description was modified by deleting the last sentence of the description and the warning. Except for the gas grill, the scenarios of all of the product incidents described events or circumstances in which someone suffered an injury or illness. The gas grill scenario described an incident resulting in a fire and property damage.

The presence or absence of warnings was manipulated as a between-participants variable; that is, a given participant either saw all scenarios with warnings or all scenarios without warnings. The order of the scenarios was random and was the same for all participants.

Results

Table 1 presents for each product the mean responsibility allocation to the consumer and to the manufacturer for the warning and no-warning conditions. The allocations to the retailer are not presented, because these values were low, the highest was less than 6%, and they did not vary with the presence or absence of warnings. A 2 (consumer vs. man-

ufacturer) × 2 (presence vs. absence of a warning) × 8 (products) mixed-model analysis of variance (ANOVA) was conducted. The retailer allocations were not included in this analysis because the retailer allocation was fairly constant and low.

In the analysis of responsibility allocation data, the main effect of agent was significant, $F(1, 27) = 247.1$, $p < .0001$, with manufacturers receiving more responsibility allocation than consumers. The main effect of product was significant, $F(7, 189) = 2.6$, $p < .02$, with the allocations varying across the set of products. The agent × warning interaction was significant, $F(1, 27) = 41.6$, $p < .0001$. For allocations to consumers, the mean allocation was 94% with warnings and 68% with no warnings. Mean allocations to manufacturers were 4% with warnings and 31% with no warnings. The agent × warning × product interaction effect was also significant, $F(7, 189) = 5.7$, $p < .0001$. This interaction indicated that the effect of the warning manipulation on the responsibility allocation to the consumer and manufacturer varied across the different products.

Discussion

The results of this experiment indicate that people are clearly influenced by the presence or absence of warnings when allocating responsibility for product safety. This shift in responsibility from the manufacturer to the consumer when a warning is included is in excess of 25%. Perhaps even more interesting is the 94% level of responsibility assigned to the consumer when warnings are available.

The significant product × agent × warning interaction indicates that the effect of warnings on responsibility allocation varied with the products. A closer perusal of Table 1 suggests a possible explanation. The consumer allocation differences for warning and no-warning conditions for three of the products—fertilizer, ibuprofen, and suntan lotion—were 49%, 40%, and 44% respectively. The allocation differences for the two warning conditions for three of the other products—gas grill, ax, and gas can—were 13%, 5%, and 10%, respectively. The interaction effect may be due to an obviousness-of-hazard factor as reported by Laughery et al. (1995) and Lovvoll et al. (1996). The hazards associated with the fertilizer, ibuprofen, and suntan lotion are primarily chemical in nature and may not be considered obvious or known to most people. The hazards associated with products such as a gas grill, ax, and gas can (gasoline), on the other hand, may be considered more obvious or better understood by consumers. For these more obvious, better known product hazards consumers are assigned higher percentages of responsibility, and there is less opportunity for warnings to influence the safety outcomes of their use. This relationship between obviousness and warning effect is further explored in Experiment 4.

EXPERIMENT 2

Although the results of Experiment 1 indicate a substantial influence of warnings on people's allocation of responsibility for product-related accidents, only the presence or absence of warnings was addressed. That is, the quality of the warnings, good or poor, was not manipulated. It seems reasonable to assume that responsibility allocations would be influenced by the quality of the warnings, with better warnings resulting in greater allocations to consumers. Experiment 2 addressed this issue.

Method

A questionnaire was employed in which participants allocated responsibility for the outcomes of accidents involving use of products. Responsibility could be assigned to the manufacturer, the retailer, and/or the consumer (user). Scenarios describing the use of the products, the accidents, and the nature of the injuries/damages were presented. Eight different scenarios involving eight different products were employed. The three warning conditions were good, poor, and none. The warning variable was manipulated between participants; that is, in the eight scenarios seen by participants in one group all of the products had good warnings, for another group all eight scenarios had poor product warnings, and the third group had scenarios with no warning. The order of the scenarios was randomized from participant to participant.

Participants. A total of 71 students enrolled in introductory psychology courses at Rice University ($N = 27$) and the University of Houston ($N = 44$) participated. There were 33 men and 38 women. The mean age was 21, with a range of 17–46.

Materials and Procedures. As in Experiment 1, the questionnaire consisted of two parts. The first part obtained age and gender information, and the second part presented the eight accident scenarios and the lists of entities to which responsibility could be assigned. Again, responsibility was expressed as percentages and had to total 100 for each accident scenario.

The eight products involved in the scenarios are different from those in Experiment 1 and are shown in the first column of Table 2. The products were selected so as not to include those where the hazard leading to the injury or illness was patently obvious. Three versions of each scenario varied with regard to the warning; good, poor, or none. An example of a poor warning scenario, for the trampoline, follows:

> John Brent went to Sports Unlimited and purchased a trampoline, manufactured by Superior Trampoline. He wanted to have it in place

Table 2. Percent Responsibility Allocated to Consumer and Manufacturer for Different Conditions

	Consumer			Manufacturer		
Product	Good Warning	Poor Warning	No Warning	Good Warning	Poor Warning	No Warning
Cooking oil	88	87	47	10	10	45
Diving board	66	72	54	9	18	17
Infant cradle	64	49	17	28	46	70
Trampoline	87	87	57	9	11	36
Carpet cleaner	75	77	14	23	21	77
Vision visor	82	78	29	14	15	58
Auto lap belt	89	76	55	9	21	58
Belt sander	82	80	54	17	16	42
Mean	*79*	*76*	*41*	*15*	*20*	*50*

for the annual summer family reunion that was scheduled to be held at his house. A week before the reunion, John and his cousin, Jim, set the trampoline up in John's backyard and then decided to try it out. In order to get a feel for the trampoline, John began with short bounces, gradually increasing the height of his jumps and worked his way up to doing somersaults. On his third somersault, John landed on his head in the center of the mat and the impact caused him to suffer a broken neck and he is now quadriplegic. The following warning appeared on the top side of the trampoline:

CAUTION: Improper use of this product may result in severe injuries. Do not attempt to perform flips or somersaults on this product.

For the no-warning condition the last sentence of the scenario and the caution statement were deleted, and the statement "The product contained no warning information" was substituted. For the good-warning condition the caution statement was replaced by the warning shown in Figure 1.

A second example of a poor warning scenario, for the diving board, follows:

Cheryl Fisher invited her friend, Ellen Lewis, to spend a warm Sunday afternoon sunbathing and swimming in the new in-ground pool that Olympic Pool Company just completed in her backyard. After a hectic week at work, both women were looking forward to relaxing. During the first two hours, they talked, read magazines, and to cool off, they drank Diet Coke and swam in the pool. Later in the afternoon, Cheryl swam 10 laps and then decided to go off the diving board, which was manufactured by Diving Inc. and installed by Olympic with the pool. Cheryl got on the diving board, walked to the end of it, stopped and then dove into the water from a stationary position. As Cheryl surfaced

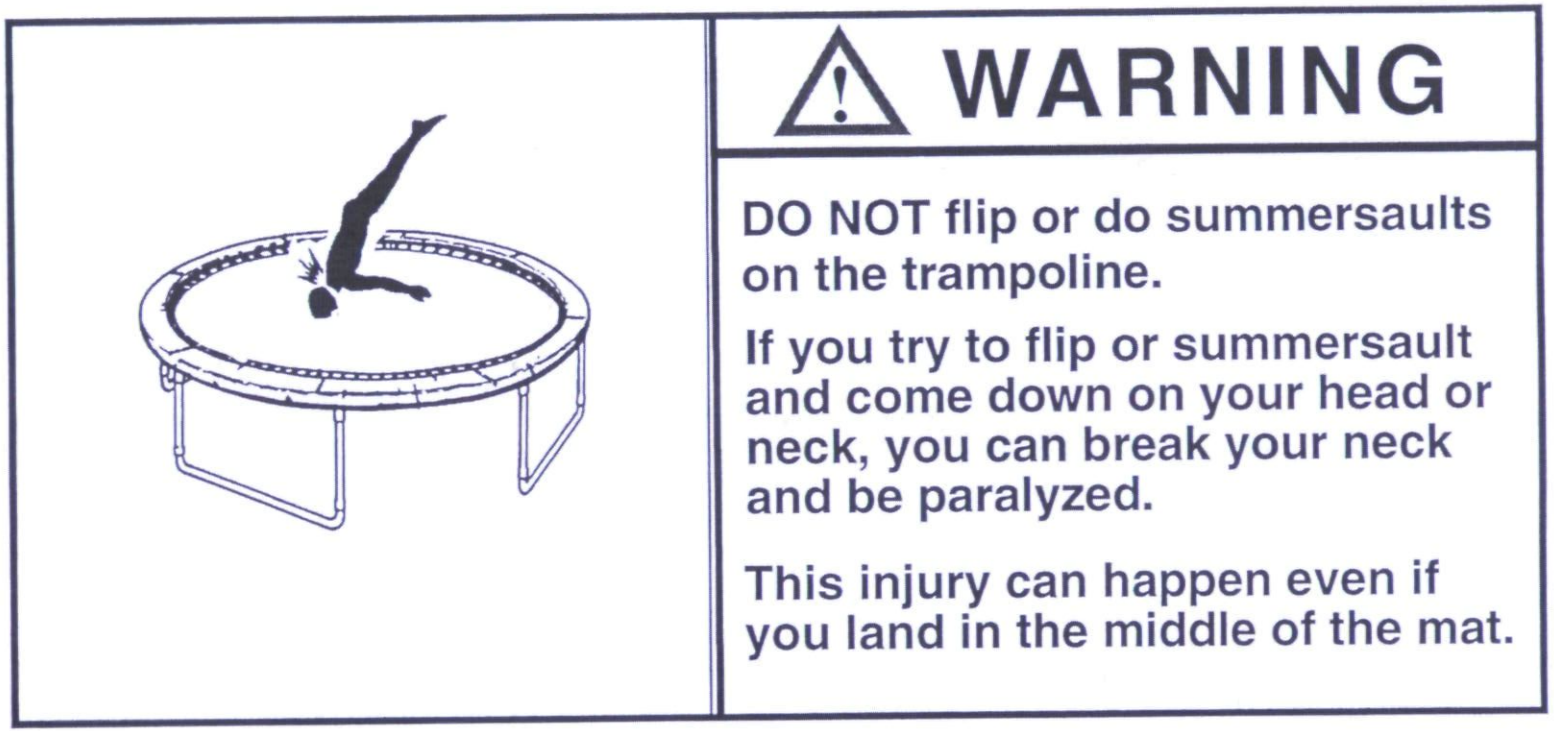

Figure 1 Good trampoline warning. Note that the signal word header had an orange background.

in the water, Ellen, who was sitting on the side of the pool dangling her legs in the water, commented to Cheryl how graceful she looked when she entered the water. Cheryl decided to go off the board again, so she got on the board and walked to the end, stopped for a few seconds and then dove into the water. This time, her head hit the bottom of the pool where it slopes up to the shallow end and as a result she broke her neck and is now quadriplegic. The following warning was on the diving board:

CAUTION: Severe injury is possible if a deep entry dive is made off this diving board. DO NOT perform a deep entry dive when diving off this board.

Again, for the no-warning condition the last sentence of the scenario and the caution statement were deleted, and the statement "The product contained no warning information" was substituted. For the good-warning condition the caution statement was replaced by the warning shown in Figure 2.

A number of design factors have been shown to affect the quality or effectiveness of warnings (Laughery & Wogalter, 1997). Design dimensions that defined differences between the good and poor warnings in this experiment were:

Pictorials: Good warnings included pictorials; poor warnings did not.

Color: Good warnings contained color; poor warnings did not.

Explicitness: Good warnings contained explicit information about the hazard, consequences and instructions; poor warnings were nonexplicit or vague.

In addition to varying along these three dimensions, the good warnings were presented in a format consistent with the ANSI Z535.4 standard (ANSI, 1991) whereas the poor warnings were simply presented in paragraph form.

Results

Table 2 presents the mean responsibility allocation to the consumer and to the manufacturer for the three warning conditions. The allocations to the retailer are not presented, because again, with one exception, these values were low, under 7%, and did not vary with the warning manipulation. The exception was the diving board product where the hazard was striking the bottom of a pool, a broken neck, and quadriplegia. With this scenario the retailer was assigned 21% responsibility.

A 2 (consumer vs. manufacturer) $\times$ 3 (good vs. poor vs. no warning) $\times$ 8 (products) mixed-model ANOVA was employed. The agent main effect was significant, $F(1, 68) = 79.4$, $p < .0001$, with manufacturers allocated more responsibility than consumers. The product main effect

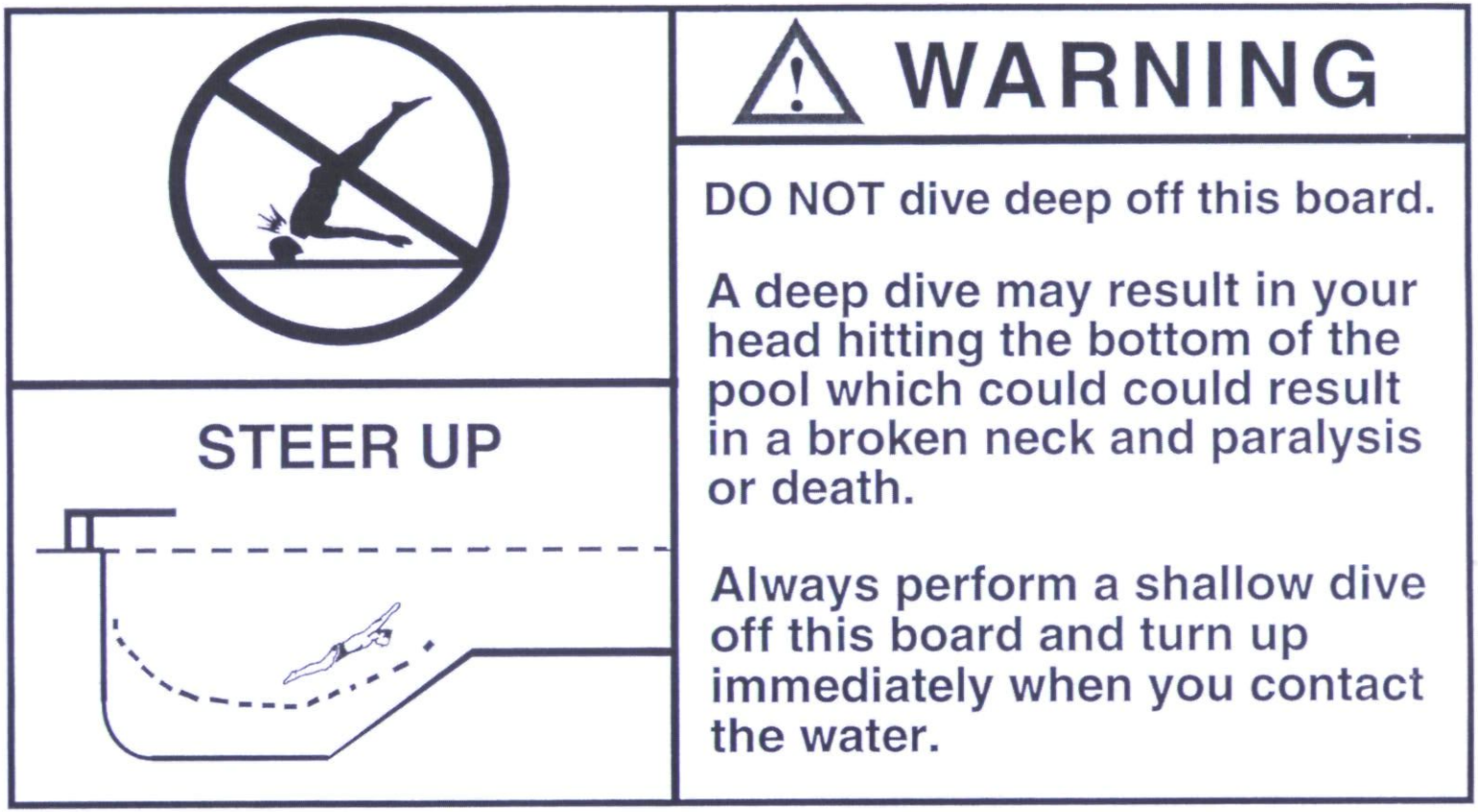

Figure 2 Good diving board warning. Note that the signal word header had an orange background.

was significant, $F(7, 476) = 20.5, p < .0001$, with the allocations varying within the set of products. The agent × warning interaction was significant, $F(2, 68) = 27.6, p < .0001$. Mean allocations to consumers for the good, poor, and no-warning conditions were 79%, 76%, and 41%, respectively. Mean allocations to manufacturers for the good, poor, and no-warning conditions were 15%, 20%, and 50%. The no-warning allocations were significantly different from the good and poor warnings, but the latter two did not differ. The agent × warning × product interaction was significant, $F(14, 476) = 5.1, p < .0001$. This interaction indicated that the effect of the warning manipulation on the responsibility allocation to the consumer and manufacturer varied across the different products. From Table 2, it appears that the greatest warning effect was for the infant cradle, carpet cleaner, and vision visor.

Discussion

As in Experiment 1, the presence of a warning had a substantial effect on responsibility allocation for product safety. Of particular interest, however, was the finding that allocations did not differ as a function of whether the warning was good or poor. This outcome is somewhat surprising, because the research reported on warning effectiveness (see DeJoy, 1989; Laughery & Wogalter, 1997) indicates that design parameters can influence whether or not warnings are noticed, read, understood, and heeded. One possible explanation for this outcome is that participants in the experiment saw only good or only poor warnings and simply made allocation decisions on the basis of the warnings being present. They may not have considered that warnings without color are less noticeable or that nonexplicit hazard or consequence information is less likely to result in safe behavior. In short, they may not have considered the quality of the warnings in performing the allocation task.

The significant interaction effect appeared to be attributable to the obviousness or familiarity of the product hazard. The three products where the warning effect was greatest—infant cradle, carpet cleaner, and vision visor—were in accident scenarios where the hazard and outcome would probably not be known beforehand.

EXPERIMENT 3

The third experiment was a further effort to explore possible differences in responsibility allocations as a function of good versus poor warnings. More specifically, good and poor warnings were manipulated as a within-participants variable so as to encourage the consideration of warning quality as a factor.

Table 3. Percent Responsibility Allocated to Consumer and Manufacturer for Good and Poor Warning Conditions

	Consumer		Manufacturer	
Product	Good Warning	Poor Warning	Good Warning	Poor Warning
Cooking oil	90	80	8	18
Diving board	78	60	7	18
Infant cradle	74	50	19	44
Trampoline	91	76	6	20
Carpet cleaner	81	70	16	26
Vision visor	84	72	12	23
Auto lap belt	83	69	12	26
Belt sander	84	75	11	21
Mean	*83*	*69*	*11*	*25*

Method

As in the first two experiments, a questionnaire was employed in which participants allocated responsibility for the outcomes of accidents to the product manufacturer, the retailer, and/or the consumer (user).

Participants. Thirty-eight students enrolled in introductory psychology courses at Rice University ($N = 16$) and the University of Houston ($N = 22$) participated. There were 17 men and 21 women. The mean age was 20 with a range of 18–27.

Materials and Procedures. The first part of the questionnaire requested age and gender information. The second part contained the same eight scenarios as in Experiment 2. In this experiment, however, each scenario was followed by both a good warning and a poor warning. The participant's task was to read the scenario, examine both warnings, and then make separate responsibility allocations for the two warning conditions. The arrangement of the good and poor warnings was counterbalanced such that each participant saw four scenarios with the good warning first and four scenarios with the poor warning first. The order of these scenarios was randomized from participant to participant.

Results

Table 3 presents the mean responsibility allocation to the consumer and to the manufacturer for the good and poor warning conditions. Mean responsibility allocated to the retailer was approximately 6%, and did not vary as a function of type of warning, except for the diving board (19%).

A 2 (consumer vs. manufacturer) × 2 (good vs. bad warnings) × 8 (products) ANOVA was carried out. The agent main effect was significant, $F(1, 37) = 268.7$, $p < .0001$, with manufacturers allocated more responsibility than consumers. The product main effect was significant, $F(7, 259) = 18.1$, $p < .0001$, with mean allocations varying across products. The agent × warning interaction was significant, $F(1, 37) = 16.3$, $p < .0001$. Mean allocations to consumers for the good and poor warning conditions were 83% and 69%, respectively. Mean allocations to manufacturers for the good and poor warning conditions were 11% and 25%.

Discussion

When participants had an opportunity to examine both good and poor warnings before allocating responsibility, they allocated more responsibility to the consumer and less to the manufacturer when the warnings were good. This finding is consistent with research on warning design and effectiveness, which has indicated that warnings are more likely to be noticed, read, understood, and heeded if they include a pictorial and color, and if they are explicit in stating hazard, consequence, and instructional information. The results also support the use of the ANSI Z535.4 standard as a guideline for warning design.

EXPERIMENT 4

The fourth experiment was an effort to further address the relationship between the presence or absence of warnings and the obviousness of or familiarity with hazards associated with products. The hypothesis or prediction is that when product hazards are more obvious, there will be less effect of warnings on responsibility allocation. An additional variable, severity of injury, was also introduced.

Method

A questionnaire was employed and participants allocated responsibility to manufacturers, retailers, and consumers for accidents involving products. Ten scenarios described the use of products, the accidents, and the resulting injuries.

Participants. Eighty-eight students enrolled in introductory psychology courses at Rice University ($N = 43$) and the University of Houston ($N = 45$) served as participants. There were 20 men and 68 women. The mean age was 20, with a range of 17 to 36.

Materials and Procedures. The questionnaire again consisted of two parts. Part 1 contained two demographic items, age and gender. Part 2

Table 4. Severity Ratings and Obviousness Ratings for Each Product Scenario

	Injury Severity		Severity Ratings		
Product	High	Low	High	Low	Obviousness Ratings
Nyquil®	Stroke/paralysis	Dizziness/headache	7.0	3.8	2.3
Erythromycin	Bleeding stomach ulcer with surgery	Upset stomach with vomiting	5.7	3.7	2.5
Ibuprofen	Severe mental retardation—newborn	Minor respiratory complications—newborn	7.5	4.9	3.3
Fertilizer	Chemical burns hands deformed	Irritating rash on hands	5.9	3.0	3.5
Pesticide	Loss of 50% lung capacity	Bronchial cough	6.2	3.7	3.7
Saw	Lost use of dominant hand	Cut on hand	5.9	3.9	4.1
Tire	Irreversible brain damage	Bruised arm	7.1	3.5	4.3
Grill	Fire totally destroyed house	House fire caused $500 damage	5.3	5.2	4.3
ATV	Quadriplegic	Gash on head	7.3	5.0	5.0
Ax	Lost sight in one eye	Eye irritation/wore patch for 2 days	6.0	4.5	5.4
Mean			*6.4*	*4.1*	*4.8*

presented 10 different accident scenarios and with each scenario a list of the entities to which responsibility for the accident could be assigned.

The 10 products involved in the scenarios are shown in the first column of Table 4. Four different versions of each scenario were used to manipulate the two variables—presence or absence of a warning and severity of injury. Two versions contained a warning and two did not. Within each of these, one involved a high-severity injury and one a low-severity injury. The high- and low-severity injuries are shown in Table 4.

Following the allocations of responsibility for the 10 product scenarios, the participants provided ratings for each of the scenarios on two dimensions. First, they rated the severity of the injury and second the obviousness of the hazard. Both ratings employed 9-point scales that were appropriately labeled (0 = no injury, 8 = extremely severe injury; 0 = not at all obvious, 8 = very obvious).

The experiment was a 2 (consumer vs. manufacturer) × 2 (presence

vs. absence of a warning) × 2 (high vs. low injury severity) × 10 (products) mixed-model design. All 10 scenarios seen by a given participant were for one of the four warning by injury severity conditions.

Results

Table 5 presents for each product the mean allocation of responsibility to the consumer and to the manufacturer for each of the four conditions of warning and severity. Allocations to the retailer are not presented, because these values were low, about 7%, and did not vary as a function of the other variables. The one exception was for erythromycin, where the pharmacy retailer was assigned 27% responsibility.

The ANOVA indicated a significant main effect of agent, $F(1, 84) = 89.6$, $p < .0001$, with manufacturers receiving more responsibility allocation than consumers. The main effect of product was significant, $F(9, 756) = 33.4$, $p < .0001$, with allocations differing for the various products. The agent × warning interaction was significant, $F(1, 84) = 139.6$, $p < .0001$. The mean allocations to consumers was 85% and 41% with and without warnings. The mean responsibility assigned to manufacturers was 11% and 49% with and without warnings, respectively.

The agent × warning × product interaction was significant, $F(9, 756) = 31.8$, $p < .0001$. The data indicate that the presence of a warning had a much greater effect on the responsibility allocation for some products than for other products. The means in Table 5 show that warnings had a greater effect for the first five products listed (chemical hazards) than for the second five products (mechanical hazards).

In order to test the notion that these differences are related to how obvious the hazards are, correlations were computed between hazard obviousness ratings (see Table 4) and the responsibility allocations for the different products. When there was a warning, the correlations were low: $r = -0.12$ for manufacturer allocations and $r = 0.16$ for consumer allocations. Although statistically significant ($p < .01$), the magnitude of the relationship is clearly very small. When there was no warning, the correlations were much higher: $r = -0.51$ and 0.58 for the manufacturer and consumer allocations, respectively.

The injury severity manipulation did not produce a main effect. Indeed, the mean responsibility allocations were similar for the low- and high-severity conditions: 65% and 61% for the consumer and 28% and 32% for the manufacturer. The agent × severity × product interaction was significant, $F(9, 756) = 2.4$, $p < .02$, as was the agent × warning × severity × product interaction, $F(9,756) = 2.7$, $p < .003$. The means shown in Table 5 indicate that when a warning was present, the manufacturer was assigned a greater amount of responsibility (and the consumer a lesser amount) in the high-severity condition for virtually all of the products. When there was no warning, there was no clear pattern of severity effects across products.

Table 5. Mean Responsibility Allocations to Consumer and Manufacturer for the Severity and Warning Conditions

	Consumer				Manufacturer			
	High Severity		Low Severity		High Severity		Low Severity	
	Warning	No Warning	Warning	No Warning	Warning	No Warning	Warning	No Warning
NyQuil®	91	12	91	22	8	84	6	65
Erythromycin	66	20	87	11	14	37	4	53
Ibuprofen	86	27	91	33	12	64	2	61
Fertilizer	78	25	91	16	19	70	7	74
Pesticide	83	20	90	22	13	78	7	71
Saw	74	47	79	44	22	50	18	49
Tire	68	70	93	67	20	20	6	27
Grill	77	69	91	70	21	28	9	26
ATV	84	58	88	27	11	35	11	58
Ax	87	89	91	73	12	10	7	23
Mean	*79*	*44*	*89*	*39*	*15*	*48*	*8*	*51*

Discussion

The statistically significant but low correlations between obviousness and responsibility allocation when warnings were present is probably a ceiling effect. When there were no warnings the correlations were higher. Thus, these results are at least consistent with the notion that warnings are given less weight in allocating responsibility for accidents where hazards are obvious.

The outcome of the experiment regarding injury severity seems to indicate that how badly a person is injured does not have a substantial influence on the allocation of responsibility. The modest differences in allocation when warnings were present may reflect some sort of sympathy factor. In the context of jury decisions in litigation, the limited effect of injury severity seems to indicate that although damages may certainly be a function of how badly one is injured, liability (who is responsible) may not be greatly influenced.

GENERAL DISCUSSION

The results of the four experiments clearly indicate that warnings play a significant role in people's allocation of responsibility for product safety. The additional responsibility allocated to consumers when warnings were present ranged from 25% to more than 40% in the different studies. In the third experiment the difference in consumer allocations for the good and poor warnings was 14%.

It is interesting to note that in Experiment 2 there was no difference in responsibility allocations for good and poor warnings. Our explanation for this outcome is that given the between-participants design in which participants only saw one type of warning, their allocations were probably based more on the fact that a warning was present than on the quality of the warning. This interpretation is supported by the outcome of Experiment 3 in which participants were required to examine both good and poor warnings before making allocations. Presumably, this analysis of both warnings enabled them to be more aware of the quality of the warnings and to take this information into account in making the allocations. Alternatively, of course, the procedure in Experiment 3 wherein participants saw both good and poor warnings may have created a demand characteristic; that is, they may have recognized differences in the quality of the warnings and based their allocations on what they thought was expected of them. It should be remembered, however, that the differences between the good and poor warnings have been shown in previous research to influence whether warnings are noticed, read, understood, and heeded. Thus, there may be good reason to assume the effects of warning quality are not simply the result of demand characteristics.

There may be various explanations of why people shift responsibility from the manufacturer to the consumer when warnings are given, especially if good warnings are given. One notion is that warnings may be viewed as part of the product's design, and the manufacturer who has not warned or not warned adequately about its associated hazards has not provided a safe product. A related idea is that when good warnings are provided with a product, the consumer is expected to take advantage of that information and exercise appropriate care in using the product. Another contributing factor may be people's views about their right to know or their right to have the information to make informed decisions. To the extent that such information is judged necessary to make informed decisions about safe product use, people may regard it as an important responsibility of the manufacturer to provide it.

This latter point would also suggest that in circumstances where information is already available about safe product use as a result of previous experience or the obviousness of the hazard, warnings would be regarded as less of a factor in assigning responsibility. The results of these experiments are consistent with this interpretation.

Two additional concepts that warrant comment in considering the responsibility allocations in these experiments are Defensive Attribution Theory (Walster, 1966) and hindsight (Fischhoff, 1982). Hindsight would lead one to expect participants, after reading the scenarios, to judge hazards described in the scenarios as more obvious. Defensive attribution predicts that people will personally distance themselves from other consumers by believing that they, themselves, are more knowledgeable or competent to deal with the hazards leading to the assignment of greater responsibility for injury events to victims. These two concepts, taken together, may account for consumers being assigned greater responsibility, especially when warnings are present.

It is interesting to note that injury severity played a very modest role in the allocation of responsibility for the accidents. The outcome of Experiment 4 indicated that a circumstance in which severity was a factor was when warnings were present, manufacturers were assigned greater responsibility for severe injury accidents than for less severe injuries. It may be that when there is a potential for severe injury, people expect manufacturers to do more that just warn; that is, there may be expectations that in such circumstances manufacturers have a responsibility to consider safer design alternatives.

These results also have implications for understanding jury decision making in product liability litigation. The findings suggest that manufacturers will pay a price for failure to warn, and they need to make an effort to provide good warnings. Similarly, the results suggest that if good warnings are provided, consumers are expected to make use of the warning information.

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