PEST-CONTROL PRODUCTS: READING WARNINGS AND PURCHASING INTENTIONS

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ABSTRACT

This research is part of a large study examining people's perceptions of household pest-control products. Described in this report are the variables associated with peoples' willingness to read warnings on these products and the variables associated with likelihood to purchase. Two subject samples, comprised of 70 undergraduates and 20 adults, examined 22 pest-control products and responded to a questionnaire assessing perceptions of the products, the packaging, and the warnings. Results showed that product hazardousness, warning understandability, and warning attractiveness strongly related to subjects willingness to read the warnings. Unexpectedly, readability analyses indicated subjects would more likely read warnings with more sentences/statements and written at higher grade levels. A different set of variables was related to purchasing intentions. Subjects reported greater willingness to purchase products that were more familiar and which had more attractive packaging. Regression analyses were also performed to obtain models predictive of reading warnings and purchasing intentions. The results are discussed in terms of manufacturers' concerns of sales and consumer safety. The relative independence of subjects' purchasing intentions and the variables related to reading warnings suggests that manufacturers can place appropriate and effective warnings on pest-control products without the fear of reduced buying intentions.

INTRODUCTION

Based on a sample of representative hospitals in the U.S., the National Electronic Injury Surveillance System (NEISS) estimates that in 1988, 14,736 people were admitted to emergency rooms for pesticide product-related injury (U.S. Consumer Product Safety Commission, 1988). Of these injuries, 88.3% were released following medical treatment, while 11.7% resulted in hospitalization. Most pest-control products contain warnings and instructions, many of which are required by the Federal Insecticide, Fungicide, Rodenticide Act (McKenna, Conner, & Cuneo, 1987) for the purpose of warning consumers against misuse and accidents. Despite the presence of warnings and the extensive publicity in the media, people are apparently not adequately aware of the potential misuse of pesticides as evidenced by the number of injuries.

The purpose of the present research was to examine people's perceptions of one category of consumer pesticides, household pest-control products. One focus of the present report was to investige the variables predictive of reading warnings on these products.

Prior research has examined variables related to reading instructions and warnings for a wide range of various product categories. Using a list of 60 products, Wright, Creighton, and Threlfall (1982) found that subjects were less likely to read instructions for products used frequently and simple to operate. However, other attitudes, including product safety, did not relate to willingness to read instructions. Godfrey and Laughery (1984) surveyed women on their awareness of the hazards of tampon use, knowledge of the symptoms of toxic shock syndrome, and awareness of warnings. They found that females who were more familiar with tampon products were less likely to notice warnings when they subsequently switched brands.

Using eight generic names of common consumer products (including plant food, oven cleaner, and pesticide) as stimuli, Godfrey, Allender, Laughery, and Smith (1983) found that subjects would be more likely to look for warnings on less familiar and more hazardous products. However, for products that were most hazardous (e.g., pesticide), subjects' degree of familiarity did not matter: Subjects still reported they would look for and read warnings.

Wogalter et al. (1986) also examined the relationship between willingness to read warnings and perceptions of hazardousness and familiarity. Ratings of 72 consumer products indicated that while perceptions of hazardousness and familiarity are both highly related to willingness to read warnings, perception of hazardousness was the most important determinant of people's reported willingness to read warnings.

Thus, prior research suggests that reading warnings can be predicted from perceptions of hazardousness, and to some extent, familiarity. However, subjects in these studies rated a wide range of consumer goods and were exposed to generic product names--not to actual products. Thus, it is not clear whether perceptions of hazardousness and familiarity are useful predictors of reading warnings when subjects are exposed to actual products and when products within a class (pest-control products) are considered rather than a range of consumer products. Would the results found in earlier research be confirmed? In particular, would willingness to read warnings be predicted by product hazardousness and familiarity?

Also examined was whether warning understandability/ comprehensibility is a useful predictor of reading warnings. The importance of warning comprehensibility is self evident: Warnings need to be understood to be effective. Warning comprehensibility was assessed in two ways: (1) Subjects rated the warnings on understandability, and (2) the warning text was analyzed by two standard readability formulae.

Would these measures be related to willingness to read warnings?

Another purpose of the present report was to examine whether purchasing intentions can be accounted for by the same variables predictive of reading warnings, and if not, to determine the types of variables related to likelihood of purchasing pest-control products. There are two reasons why this relationship was of interest. The first is the often heard claim offered by manufacturers in litigation cases for not including strong (and perhaps, more effective) warnings on their products: It will scare consumers and decrease sales. The second reason comes from an intriguing finding of Ursic (1984). Ursic presented subjects with display boards containing information on three hypothetical brands of bug killers and hair dryers in which warnings were manipulated. Ursic found that people perceive products with warnings to be safer and more effective. However, variations in the warnings' format had no effect. The present research asked: Would people's purchase decisions be influenced by warning-related variables?

METHOD

Subjects

Seventy University of Richmond freshmen participated for class credit in their introductory psychology courses. A second group, consisting of 20 adults (M = 36.95, SD = 7.70), were paid for their participation.

Four pesticide experts were asked to evaluate the products' hazardousness. One was employed by the Virginia Department of Health's Toxic Substance Information Department, one with the Virginia Department of Agriculture and Consumer Services' Office of Pesticide Regulation, and two were administrators with different professional pest-control organizations.

Materials and Procedure

Twenty-six household pest-control products that are available over-the-counter in hardware, drug, and grocery stores were purchased. All of the products were claimed to control roach problems. Flying-insect sprays and agricultural pesticide products were not included. Product brands were selected for inclusion based on their being sold in at least three chain stores in the Richmond, Virginia area. Of the original set, four were roach traps which did not contain warnings on the packaging. Because the primary interest of this report was to examine the variables related to reading warnings, analyses of the trap data will not be discussed here. The 22 included products are shown in Table 1 categorized by product type.

Table 1. *Pest-Control Products Categorized by Type.*

Fumigators		
	Hobbs	Raid
Foggers		
	Black flag	d-Con
	Hot Shot	No-Roach
	Raid	Real Kill
	Rid-A-Bug	TNT
Sprays		
	Black Flag	Combat
	d-Con	Hot Shot
	No-roach	Raid
	Real Kill	TAT
Controller Systems		
	Black Flag	Combat
	d-Con	Raid

A product perception questionnaire was used to assess subjects' perceptions of the products' packaging, labeling, and warnings. Responses were recorded using 8-point Likert-type scales anchored with 0 denoting absence of quantity to 8 indicating maximum quantity. Items from the questionnaire are shown in Table 2.

Table 2. *Product Perception Questionnaire.*

1. "*How hazardous* do you think the product is?" with the anchors: (0) not at all hazardous, (2) somewhat hazardous, (4) hazardous, (6) very hazardous, and (8) extremely hazardous.
2. "*How familiar* are you with this product?" with the anchors: (0) not at all familiar, (2) somewhat familiar, (4) familiar, (6) very familiar, and (8) extremely familiar.
3. "*How likely* is it that you would *read* the warning on the *back* (or side) panel of the package?" with the anchors: (0) never, (2) unlikely, (4) likely, (6) very likely, and (8) extremely likely.
4. "*How understandable* is the warning on the *back* (or side) panel of the package?" with the anchors: (0) not at all, (2) somewhat understandable, (4) understandable, (6) very understandable, and (8) extremely understandable.
5. "*How attractive* (appealing) is the warning label on the *back* (or side) panel of the package?" with the anchors: (0) not at all attractive, (2) somewhat attractive, (4) attractive, (6) very attractive, and (8) extremely attractive.
6. "*How attractive* (appealing) is the packaging of this product in general?" with the anchors: (0) not at all attractive, (2) somewhat attractive, (4) attractive, (6) very attractive, and (8) extremely attractive.
7. "*How strong* (potent) do you think the product is?" with the anchors: (0) not at all strong, (2) somewhat strong, (4) attractive, (6) very strong, and (8) extremely strong.
8. "*How careful* would you be when using this product?" with the anchors: (0) not at all careful, (2) somewhat careful, (4) careful, (6) very careful, and (8) extremely careful.
9. "*How likely* are you to be injured in any way while using this product?" with the anchors: (0) never, (2) unlikely, (4) likely, (6) very likely, and (8) extremely likely.
10. "*How difficult* would it be to use this product?" with the anchors: (0) not at all difficult, (2) somewhat difficult, (4) difficult, (6) very difficult, and (8) extremely difficult.
11. "*How likely* are you to *purchase* this product?" with the anchors: (0) never, (2) unlikely, (4) likely, (6) very likely, and (8) extremely likely.

All 22 products contained the same basic three-line front-panel warning:

KEEP OUT OF REACH OF CHILDREN
CAUTION
See back (side) panel for additional precautionary statements

This front-panel warning is required by the Federal Insecticide, Fungicide, and Rodenticide Act (McKenna, Conner, & Cuneo, 1987). Because the front-panel warning was nearly identical for all products, the items of the questionnaire assessing its perception will not be reported here. Rather, the present report focusses on perceptions of the longer back- (or side) panel warnings

The large study also included collection of subject demographics and other product-related data. The demographic information included sex, age, place of residence, prior pest-control problems, and previous use of pest-control products. Products were coded for objective characteristics such as chemical contents (e.g., active and inert ingredients and percentages), duration of effectiveness, pests effective against, packaging characteristics, characteristics of the warnings (e.g., location on package, text formatting, size, and color). The content of the warnings were also categorized and coded including mention of symptoms, antidote, danger to pets, note to physician, and poison hot-line information. Analyses of the demographic and the objective product characteristics data will not be discussed in this report.

Product Perception Procedure. Subjects were run in groups of three to eight. The pest-control products were placed on tables in a large room each next to a numbered identification. After completing a demographics questionnaire, subjects were given the product perception questionnaire and a booklet of randomly-ordered response forms. They were told that each response form was numbered to correspond to one of the products in the room, that they were to examine each of the products in the order indicated by his or her own response form packet, and to complete the questionnaire for each product before moving to the next one. For safety reasons, subjects were allowed to handle the products but not to operate them in any way.

Readability. Measures of readability of the back-(or side) panel warning text were obtained. Because many statements on the containers lacked punctuation, prior to the readability assessments, punctuation was added where appropriate to avoid erroneous sentence length scores. Each label was analyzed for the number of words, number of sentences/statements, and two measures of reading grade level: the Flesch index (1948) as modified by Gray (1975), and the Coleman and Liau (1975) index. Because it was difficult to distinguish between warnings and instructions on the labels, a warning was thus defined as all text containing signal words, directions/instructions for preparation, proper use, and storage/disposal, and text that described physical, chemical and environmental hazards.

RESULTS

Subject ratings for each product and question were collapsed producing 22 product means for each of the rated questions and these scores (pest-control products) were used as the random variable in the analyses. The expert ratings of the products' hazardousness validated the students', $r = .931$, $p < .001$, and adults' $r = .609$, $p < .001$, perceptions of the pest-control products' hazardousness.

Likelihood of Reading Warnings

Student Perceptions. Initial analyses of the student data sought to determine the variables related to subjects' likelihood of reading warnings. Table 3 shows that willingness to read warnings was significantly and positively related to product hazardousness, judged understandability of the warning, attractiveness of the warning, carefulness when using the product, and likelihood of being injured while using the product.

Adult Perceptions. Table 3 also shows the correlations for the adult subjects. In general, the relationships were smaller for the adults than the were for the students but they demonstrate a similar pattern. Like the student subjects, willingness to read warnings was significantly and positively related to product hazardousness, judged understandability of the warnings, and attractiveness of the warnings. In addition, strength/potency and difficulty in using the product was positively related to willingness to read the warnings. The positive relationships of willingness to read warnings with carefulness and injury likelihood that were seen with the student data were not shown.

Likelihood of Purchasing

Student Perceptions. For the most part, a different set of variables was related to likelihood of purchasing the products. Likelihood of purchasing was positively related to product familiarity, packaging attractiveness, and product strength/potency, and was negatively related to product hazardousness, likelihood of being injured, and difficulty of using the product. Thus, only two variables in the set, hazardousness and likelihood of injury, were significantly related with both willingness to read the warning and likelihood to purchase; however, the relationships were relatively small and in opposite directions. The simple

Table 3. Correlations of Willingness to Read and Likelihood to Purchase Pest-Control Products with Perception Variables of Student and Adult Subjects.

	Students		*Adults*	
	Read Warning	Likely to Purchase	Read Warning	Likely to Purchase
Hazardousness	.643**	-.429*	.498*	.059
Familiar Product	-.036	.951**	.189	.858**
Understand Warning	.931**	.029	.893**	.287
Attractive Warning	.892**	.118	.685**	.370
Attractive Package	-.098	.777**	.255	.772**
Strong/Potent	.350	.760**	.518*	.462*
Careful Using	.510*	-.404	.239	-.238
Injury Likelihood	.449*	-.476*	.294	-.087
Difficult to Use	.233	-.461*	.449*	-.184

* $p < .05$
** $p < .01$

correlation between willingness to read the warning and likelihood of purchasing the product was not significant (r = .038, $p > .05$).

Adult Perceptions. For likelihood to purchase, the adults, like the students, showed positive relationships with product familiarity, packaging attractiveness, and product strength/potency, but unlike the students, the adults showed no relationship with injury likelihood and difficulty of using the product. The simple correlation between willingness to read the warning and likelihood of purchasing the product was not significant (r = .259, $p > .05$).

Readability

Judgments of warning understandability was strongly and positively related to willingness to read warnings. An additional set of analyses examined whether readability of the warnings as assessed by two readability formulae would relate to willingness to read warnings. Table 4 shows for both the students and the adults, willingness to read the warnings was positively related to the number of sentence/statements and to both reading grade-level indices.

Table 4. Correlations of Willingness to Read with Readability Variables for Student and Adult Subjects.

	Willingness to Read Warnings	
	Students	Adults
Number of Words	.401	.342
Number of Sentences	.614**	.444*
Flesch Index	.552**	.456*
Coleman-Liau Index	.446*	.492*

* $p < .05$
** $p < .01$

Prediction of Reading Warnings

Multiple regression analyses were used to determine the variables that contribute to the prediction of willingness to read warnings. Because previous research (Godfrey, et al., 1983; Godfrey & Laughery, 1984; Wogalter, et al., 1986) suggests that hazardousness and familiarity might be important factors used by people in judging whether to read warnings, regression models including these factors were considered first.

Student Data. Alone, hazardousness accounted for 41.3% of the variance, $F(1, 20) = 16.06$, $p < .002$. With the inclusion of familiarity, the increment of 4.2% was not significant, $F(1, 19) = 1.47$, $p > .05$. Additional regression analyses showed that warning understandability and warning attractiveness each added significant unique variance to the model containing hazardousness (p's < .0001). When all three predictors were included the variance accounted for was substantial (96.1%), $F(3, 18) = 148.47$, $p < .0001$. No other variables (including the readability measures) significantly improved this prediction model.

Adult Data. The hazardousness variable accounted for 24.8% of the variance of willingness to read the warnings, $F(1, 20) = 6.58$, $p < .02$. The addition of product familiarity did not significantly enhance prediction (by .6%), $F(1, 19) < 1.0$. The addition of warning attractiveness to the model including hazardousness incremented the prediction of reading warnings (by 33.1%), $F(1, 19) = 14.96$, $p < .001$. The further addition of understandability significantly enhanced the model (by 24.0%), $F(1, 18) = 23.92$, $p < .0001$. No other individual variable added to the prediction of willingness to read. The regression model with hazardousness, warning attractiveness, and warning understandability accounted for 81.9% of the variance of willingness to read, $F(3, 18) = 27.19$, $p < .0001$.

Prediction of Purchase Intentions

Multiple regression analyses were also used to determine the variables that predict likelihood to purchase the products.

Student Data. Alone, product familiarity accounted for 90.5% of the variance of purchase intentions, $F(1, 20) = 191.21$, $p < .0001$. Product attractiveness added a small but significant increment of variance accounted for (by 2.0%), $F(1, 19) = 4.96$, $p < .04$. Adding a third predictor, difficulty of using the product, further enhanced the prediction (by 2.2%), $F(1, 18) = 7.55$, $p < .02$. No other individual variable added significant variance to the model. The regression model with familiarity, product attractiveness, and difficulty of use accounted for 94.7% of the variance of willingness to purchase, $F(3, 18) = 107.45$, $p < .0001$.

Adult Data. Product familiarity accounted for 73.6% of the variance of purchase intentions, $F(1, 20) = 55.65$, $p < .0001$. Product attractiveness added significant variance to the prediction (by 6.2%), $F(1, 19) = 5.86$, $p < .03$. No other individual variable added significantly to the model. The regression model with familiarity and product attractiveness accounted for 79.8% of the variance of willingness to purchase, $F(2, 19) = 37.52$, $p < .0001$.

DISCUSSION

Earlier research (e.g., Wright et. al, 1982; Godfrey & Laughery, 1984) suggested that product familiarity was related to reading warnings and instructions. The present results failed to find this relationship. The results, however, do indicate that perceived hazardousness is an important determinant of willingness to read warnings. That hazard perception is more important than perceptions of familiarity with regard to willingness to read warnings on dangerous products supports the basic conclusions of Godfrey et. al (1983) and Wogalter et. al (1986). For example, Godfrey et. al's (1983) found that familiarity was negatively related to looking for warnings on low hazard products, but for products like pesticide, hazardousness predicted reading warnings and the degree of familiarity did not.

Two other variables, the perceived understandability and attractiveness of the warnings, were shown by correlational and multiple regression analyses to be related to reading warnings. These results suggest that the appearance of the warning enhances people's willingness to read warnings. Apparently, good warning design can be a means of motivating people to seek out hazard information.

Another measure of understandability, readability, was also assessed. It had been expected that people would be more willing to read shorter, lower grade-level warnings, since most warning guidelines recommend that good warnings be concise and written for the lowest denominator of the reading public. However, the present results did not find this. Indeed, the results were significant in the opposite direction. Correlational results showed that subjects were more willing to read warnings on products that had text with containing more sentences/statements and more difficult material. On average, both readability formulae indicated that the warnings were written at approximately at the tenth-grade level. Given that our subjects were taken from populations having higher reading levels than the general population, this finding becomes less surprising. Our subjects might have preferred reading material closer to their reading level than material at lower levels. Subjects may have been willing to read longer warnings based on the assumption that they contained information that they did not know, and needed to know. More hazardous products would more likely have longer warnings in order to convey the dangers and necessary precautionary information. Because this is relational data, it is difficult to determine the direction of cause and effect: It might be that warnings with more information and having more difficult material cause perceptions of hazardousness.

Variables related to likelihood of purchasing the pest-control products were also examined. Of particular interest was to determine whether purchasing intentions could be accounted for by the same variables predictive of reading warnings. The results showed no evidence of a relationship between buying intentions and reading warnings. Familiarity and packaging attractiveness appeared to be the primary predictors of likelihood to purchase and these variables held no relationship to reading warnings. Thus, the present results suggest that in order to increase consumers' purchase intentions, manufacturers should take steps to increase consumers' familiarity with their product e.g., via advertising), and should make their product more appealing to the eye (to increase packaging attractiveness). Enhancement of these variables are apparently more likely to affect sales than variables related to the warnings.

Increasing perceptions of hazardousness, warning understandability, and warning attractiveness may facilitate that warnings will be read. The relative independence of buying intentions for these products and willingness to read warnings suggests that manufacturers can place appropriate and effective warnings on pest-control products and not be concerned with lowered consumer buying intentions. That is, better warnings should have the positive effect of reducing accidental injury, but at the same time not effecting consumer buying intentions. This finding should eliminate manufacturers' fears that warnings that effectively convey hazard information will consequently reduce sales. Instead, manufacturers should concern themselves with the high rate of pesticide product-related accidents due to misuse, which hopefully can be reduced with effective warning labels.

Finally, it should be noted that these conclusions might be limited to the set of products used in the present research. Whether the relative independence of the warning-related variables and purchasing decisions holds for other consumer other than pest-control products is an empircal question that needs further investigation; however, recent results by Stanush and Laughery (1989) suggests that the present finding might be generalizable to other classes of products as well.

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