

Montana Tech Library

## Digital Commons @ Montana Tech

---

Safety Health & Industrial Hygiene

Faculty Scholarship

---

2005

### Are Warnings on Plastic Films Adequate?

David S. Leonard  
*University of Georgia*

Roger C. Jensen  
*Montana Tech of the University of Montana*

Tammy Lynn  
*Montana Tech of the University of Montana*

Follow this and additional works at: <https://digitalcommons.mtech.edu/shih>



Part of the [Occupational Health and Industrial Hygiene Commons](#)

---

#### Recommended Citation

Leonard, David S.; Jensen, Roger C.; and Lynn, Tammy, "Are Warnings on Plastic Films Adequate?" (2005).  
*Safety Health & Industrial Hygiene*. 7.  
<https://digitalcommons.mtech.edu/shih/7>

This Article is brought to you for free and open access by the Faculty Scholarship at Digital Commons @ Montana Tech. It has been accepted for inclusion in Safety Health & Industrial Hygiene by an authorized administrator of Digital Commons @ Montana Tech. For more information, please contact [sjuskiewicz@mtech.edu](mailto:sjuskiewicz@mtech.edu).

## ARE WARNINGS ON PLASTIC FILMS ADEQUATE?

David S. Leonard<sup>1</sup>, Roger C. Jensen<sup>2</sup>, and Tammy Lynn<sup>2</sup>

<sup>1</sup>Department of Psychology  
University of Georgia  
Athens, Georgia 30602, USA  
Corresponding author's email: [dleonard@uga.edu](mailto:dleonard@uga.edu)

<sup>2</sup>Department of Safety, Health and Industrial Hygiene  
Montana Tech  
Butte, MT 59701-8997, USA

**Abstract:** Warnings are used to inform users of hazards that may be associated with many products. Often these warnings deal with the operation of tools, appliances, and other items for which the user may have some reason at least, to look for information on the product regarding its use. Plastic film presents a serious hazard to young children. Because the film will adhere to the flesh, if it covers the airways for the child, suffocation may result. Because young children may play with them, it is important that such films be kept away from them. Warnings need to be adequate to inform or remind caregivers of this fact. This study examined warnings found on various items in commerce and some alternatives to those warnings. The results showed some warnings to be poor at best. The alternative most preferred included both the prohibition sign and a symbolic indication of proper disposal.

### 1. INTRODUCTION

Warnings are included in many products, because some hazards are not eliminated or adequately guarded against. Most products are devised to be operated in some fashion by an individual, and the persons who may perform the operations will attend to instructions and warnings about their use. However, in the case of the plastic wrapping that comes on many products there is no real use for it. Although it is likely to be disposed of in due time, during the period in which other activities may take precedence it may be left where a young child can get at it. A common hazard for babies and young children is the possibility of suffocation from having the airways covered by an object that blocks the air. Because the film will adhere to the flesh, if it covers the airways or nasal passages for the child, suffocation may result. An average of 25 such deaths are reported yearly in the United States, with 90 percent of the victims being under one year of age (Consumer Products Safety Commission, 2005; Drago and Dannenberg, 1999). Thus, it is important for caregivers to be cautioned about the hazard, if only as a reminder. Because children will play with anything in exploring their environments, it is especially important when children may be exposed to a hazard to warn the caregivers of the potential for harmful effects. Many caregivers are aware of the potential hazards, but in some cases need to be informed of the particular source of danger. For example, presenting information about the presence of small parts that might be swallowed is important from an informational standpoint even though the parent may be aware of the fact that they might be swallowed. A secondary aspect to warnings is that of reminding individuals about the hazard and the means of avoiding it. This requires that the warning be attended to by the person dealing with the hazard.

In observing the warnings available on the wrappings of several products, we noted they might not be adequate to provide the appropriate information; therefore, tests were made of some currently used warnings and some alternative warnings devised in an effort to increase the likelihood that the warnings would be noticed.

### 2. EXPERIMENT 1

Many uses are made of plastic film in commerce. Often it is used to cover items while they are in transit to avoid undesirable materials coming in contact with them. In other cases plastic film is used to provide means of carrying objects. In this experiment comparisons were made between different examples of warnings on particular articles used in commerce. The comparisons were made in terms of their likelihood of capturing attention and of conveying the message that the items should not be available to small children who might play with them. Some alternative pairs of warnings were

also presented to be rated in terms of how they might attract attention and convey the message that the plastic should be kept away from children.

## 2.1 Method

### 2.1.1 Participants.

The participants were students at the University of Georgia (UGA). There were 21 women and 12 men. Their ages ranged from 18 to 25 years, with a median of 19 years. They received research participation credit in their psychology courses. They also had participated in a survey involving automobile behavior that included questions about how they responded to certain hazards that were involved in automobile and other vehicular travel.

### 2.1.2 Materials and Procedure.

Following obtaining consent forms performing the automotive survey, and presentation of instructions, participants were shown eight exemplars of warnings that are used in practice. They were instructed to rate the items on a seven point scale of how well the warning would attract attention and convey the message. The specifics of these exemplars and the ratings obtained for them are presented in the description of Experiment 2.

In this experiment, after rating the exemplars the participants were asked to rate pairs of warnings about the hazard of plastic film and small children. Separate ratings were made on a seven point scale for each warning of the pair in terms of the attention getting ability of the warning and how well the warning conveyed the message. The items included in the pairs were a figure with the prohibition of the use of plastic film by a child combined with a “to do” symbol of discarding the plastic film within a pentagon; a triangle with an exclamation point in it beside the warning; and the warning by itself. Only the pairing of the circle-slash and pentagon with the triangle and with the warning by itself will be evaluated in this report, because the number of cases in the other pairings were too small for meaningful analysis. Roughly equal numbers of the respondents had each of the warnings shown first in the pairs.

In addition to rating the alternate warnings on the seven-point scale, the respondents were asked whether or not the alternate warnings were more likely, equally likely, or less likely to attract attention and to convey the message.

## 2.2 Results

No differences were detected between males and females or between the orders of presentation; therefore, the analyses were performed on the combined data. The means for the ratings of the responses to attracting attention and conveying the message are shown in Table 1. The combined circle-slash and pentagon (to be called pentagon hereafter) was reliably better at attracting attention than the triangle with exclamation point,  $t = 3.17$ ,  $p < .01$ , and it was also reliably better than the warning alone,  $t = 9.53$ ,  $p < .001$ . Tests for differences in conveying the message were not reliable for either comparison,  $t < 1$ .

In the comparisons paired with the triangle, 14 of 19 respondents indicated the pentagon was better at attracting attention than the best of the exemplars viewed. Eight of the 19 respondents indicated the triangle with exclamation was better than the exemplars and eight indicated it as equal to the exemplars. In the comparisons with the pentagon and warning alone, 11 of 14 respondents said the pentagon was better than the exemplars, and the responses to the warning alone were split between equal to and poorer than the exemplars. Combining the responses to the pentagon in the two sets of pairings, 25 of 33 favored the pentagon over the exemplars. The combined result was reliable with  $\chi_1 = 8.76$ ,  $p < .01$ . Because additional ratings of the exemplar items were obtained in an identical fashion, the data for those ratings are included in the results for Experiment 2.

Table 1. Mean ratings for attracting attention and conveying message by type of warning

	Circel-slash & Pentagon vs. Exclamation in Triangle		Circel-slash & Pentagon vs. Warning Alone	
Rating Scale	Circle & Pentagon	Triangle	Circle & Pentagon	Warning Alone
Attracting Attention	5.53	4.11	6.36	3.29
Conveying the Message	5.32	5.21	5.86	5.21

### 3. EXPERIMENT 2

The results of Experiment 1 showed the inclusion of the pentagon as a “to do” indicator are in accord with previous uses of that symbol (e.g. Jensen, Leonard, & Jensen, 2003; Leonard, 2000; 2002), but other symbols could be equally useful. To expand the set of possible symbols examined and keep a relatively simple set of comparisons, Experiment 2 was performed. In order to make the sample of cases broader, participants were included from UGA and Montana Tech (MT). The ratings for exemplars of warnings used in commerce are also included in the results of this experiment.

#### 3.1 Method

##### 3.1.1 Participants

Responses were obtained from 60 students at UGA, 41 women and 19 men, who received research credit for participation. In addition 22 students at MT participated, 13 women and 9 men.

##### 3.1.2 Materials and Procedure

In general, the procedures for this experiment were similar to Experiment 1, but the alternate items were rated in sets of four. There were two orders for the items. In one order the first item was the warning alone, the second was the warning with the circle-slash and pentagon (called pentagon), the third item was the warning with the triangle, and the fourth item was the circle-slash alone with the warning. The second order reversed the positions of the warnings (shown in Figure 1). Again, every warning was rated on a seven-point scale for each of the characteristics of attracting attention and conveying the message.

Prior to judging the alternative warnings the respondents rated the eight pieces of plastic film that were obtained from various sources on a five-point scale of effectiveness. The exemplars were taken from items used in commerce. Basic characteristics are provided in the Appendix. There was a wrapper used to cover a computer monitor within its box. It is referred to as "package cover." Two were covers used by dry-cleaning establishments for clothing. Both of these had the warning down one side of the bag in white print. In one case the lettering of the warning was printed bold style, and the other was not. These bags are called "cleaner bold," and "cleaner not bold." Another wrapper came from a bulk package of toilet tissue. It will be referred to as "tissue." Four bags came from retail establishments. Two of them had the warning in the side vent, and they are referred to as "side one" and "side two." The other two bags also came from retail establishments, but the warnings were at the bottom of the bag in view when the bag was lying flat. These are referred to as "bottom one" and "bottom two."

#### 3.2 Results

Ratings for the exemplar items between UGA and MT were very similar,  $r = .97$ , so the data from the two sets of respondents were combined for analysis. As may be seen in Table 2 there were sizeable differences in the mean rated judgments of how well the warnings on the various covers performed. An omnibus test of the differences among the means produced  $F_{7,665} = 145.15$ ,  $p < .0001$ . Comparisons among the means showed the package cover to have a significantly higher mean rating than any of the other items. The ratings of the two items with the warnings at the bottom and the

warning on the tissue wrapper were not reliably different from one another but were dependably higher than the other four items, and the two bags with the warning in the side vent and the cleaners bag with large print were not reliably different among themselves but were significantly different from the cleaners bag with small print.

The patterns of the UGA and MT respondents to the alternative warnings were also highly similar, and therefore, the data were combined for analysis. The ordering of the mean ratings for attracting attention, as shown in Table 3, was as follows. The combination of the circle-slash and pentagon was rated most highly; next highest was the circle-slash alone; then the triangle with exclamation point. The warning without border or other symbols was considerably poorer than the others in rating of attention-getting capability. The mean ratings were reliably different,  $F_{3,82} = 161.45$ ,  $p < .0001$ . Using Tukey's HSD test all of the pairwise differences were found to be reliably different. The ratings for conveying the message were also combined for the UGA and MT groups for statistical tests. The omnibus test of differences among groups was significant,  $F_{3,82} = 21.86$ ,  $p < .001$ . However, tests of the differences among pairs of means revealed no dependable differences except that the warning alone was reliably rated lower than the other alternatives.

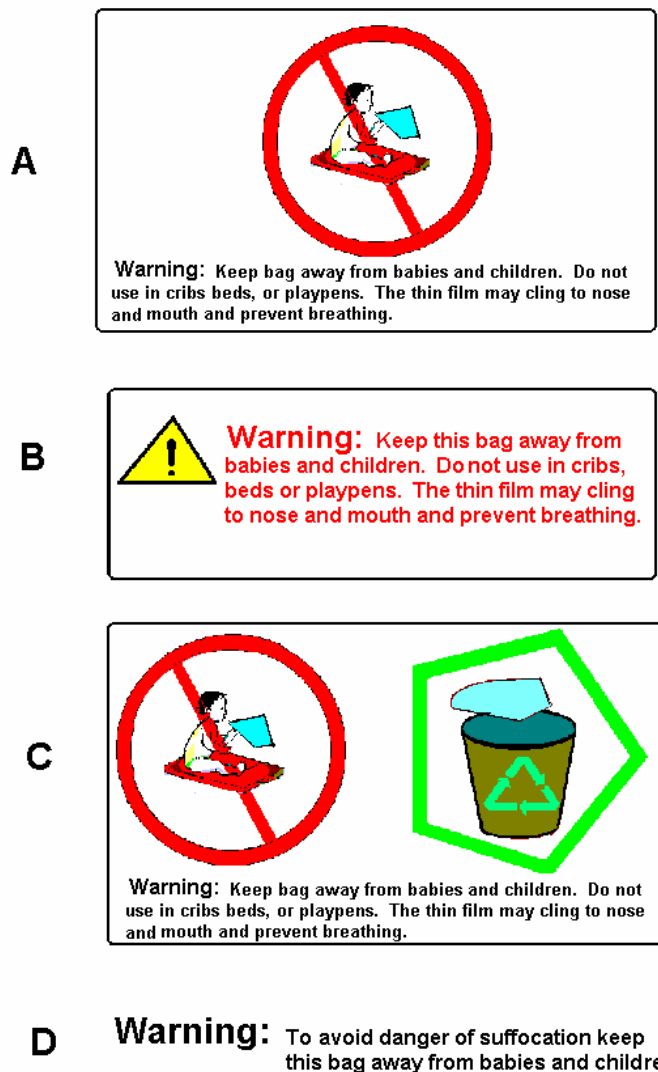


Figure 1. Alternative warnings. Colors are green for the pentagon, yellow for the triangle fill, cyan for the bag, and red for the baby blanket, circle & slash, and text in B.

Table 2. Mean ratings of example warnings by UGA and MT students.

	Package Cover	Bottom One	Bottom Two	Tissue	Side One	Side Two	Cleaner Bold	Cleaner Not Bold
Mean Rating	4.19	2.32	2.31	2.07	1.60	1.32	1.38	0.43

*Note.* Means over common line are not reliably different. All other differences significant at  $p < .01$ .

Table 3. Mean ratings of alternative warning forms for attracting attention and conveying the message.

Rating Scale	Circle-slash Pentagon	Circle-slash Alone	Triangle	Warning Alone
Attracting Attention	5.71	5.22	4.68	2.40
Conveying the Message	5.55	5.51	5.10	4.21

*Note.* Means over common line are not reliably different. All other differences significant at  $p < .01$ .

#### 4. DISCUSSION

The results of these experiments make quite clear that there are differences among the warnings currently in use to warn against the hazard of leaving plastic film where babies or young children may get it. The most highly rated item in the commercial exemplars was the wrapping that came from a computer monitor. It was different from most of the other items in that the warning was all that was on the plastic. The warning was in dark red ink, and readily visible. The only other item with only the warning on it was the lowest rated exemplar. The writing on it was in small, not bold, and the white lettering provided minimal contrast with the transparent plastic. The other items tended to have a good deal of writing of an advertising sort on them. Possibly they might have been rated higher had the warning been more salient. This notion is supported by the fact that the retail bags that had the warning in the side vent were rated less effective than those with the warning in sight with the bag closed. Three bags inserted text at the end of the warning message about recycling, country of origin, and/or patents. This also negatively affects salience of the warning message.

The alternative warnings provided evidence that presenting information about what is to be done along with what is prohibited may increase the effectiveness of a warning as suggested by Leonard (2000). The attention-getting aspect of warnings of this sort may be most important, in that the warnings may serve as a reminder of what the individuals seeing them may already know. This might cause people to be less careless in the way they treat the hazardous material. The conveying-message aspect of warnings showed little difference in the ratings. Inasmuch as the written information in the warnings was essentially the same, this might be expected. The lower rating for the plain warning could be a little bit of carryover from the ratings of attracting attention. In addition, some respondents may have thought that attention was a relevant part of conveying the message.

The combination of results suggests that it may be useful to increase the salience of the warnings about the hazard of plastic film around children. Some further research might include providing items similar to the exemplars, but with various warning formats included. In addition, testing for the effect of reducing visual noise in currently used items should be done.

## 5. REFERENCES

1. Consumer Product Safety Commission (March 2005). <http://www.cpsc.gov/cpsc/pub/pubs/5064.html>
2. Drago, D.A. and Dannenberg, A.L. (1999). Infant Mechanical Suffocation Deaths in the United States, 1980-1997, *Pediatrics*, 103.5 pp. 59-66.
3. Film & Bag Federation (March, 2005). <http://www.plasticbag.com/industry/warning.html>
4. Jensen, R.C., Leonard, S.D., & Jensen, L.S. (2003). Influence of Color on Importance of "to do" Symbol. In H. Strasser, K. Kluth, H. Rausch, H. Bubb (eds.) *Quality of Work and Products in Enterprises of the Future*. Stuttgart: Ergonomia Verlag oHG, pp. 467-470.
5. Leonard, S.D. (2000). To Do or Not To Do?: Both are the Questions. In *Proceedings of the 13th Triennial Congress of the International Ergonomics Association* v. 4, pp. 786-789.
6. Leonard, S.D. (2002). A Comparison of Symbols for Preferred Behaviors. *Proceedings of the Human Factors Society 46th Annual Meeting--2002*, Santa Monica, CA: Human Factors Society, pp. 1739-1743.

ACKNOWLEDGMENTS. The Montana Tech authors of this article were partially supported by Grant No. T03/CCT81449 and/or Grant R25 OH 008319 from the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health. The contents are solely the responsibility of the authors and do not necessarily represent the official views of the National Institute for Occupational Safety and Health.

## APPENDIX

### Characteristics of Warnings on Exemplar Bags

Description	Exhibit Number	Color	Case	Serif or Sans serif	Point Size	Other
Package Cover	2	Red	CAPS	Sans	42	Footnote 1
Cleaner Not Bold	4	White	CAPS	Sans	22	Footnote 2
Cleaner Bold	1	White	CAPS	Sans	18&36*	Text similar to Footnote 2
Tissues	7	Black	Sentence	Sans	14	Footnote 3. Yellow background
Side One	3	Orange	CAPS	Sans	11	Text similar to Footnote 2
Side Two	8	Red	CAPS	Sans	12	Text similar to Footnote 2
Bottom One	6	Purple	Sentence	Sans	14	Footnote 4
Bottom Two	5	Red	CAPS	Sans	12	Footnote 5

\* The signal word, WARNING, was printed in 36 point size; the text was 18 point.

Examples of Text Messages and Formats. Typefaces below are similar to those on the products, but not identical. Font sizes are not matched to those on the actual product.

#### 1. Package Cover

**THIS BAG IS NOT A TOY**  
**WARNING: TO AVOID DANGER OF SUFFOCATION, KEEP THIS BAG AWAY FROM BABIES AND CHILDREN. DO NOT USE IN CRIBS,**

**BED, CARRIAGES, OR PLAY PENS.  
THIS BAG IS NOT A TOY. KNOT  
BEFORE THROWING AWAY.**

2. Cleaner Larger

**WARNING:** TO AVOID DANGER OF SUFFOCATION, KEEP THIS BAG AWAY FROM BABIES AND CHILDREN.  
DO NOT USE IN CRIBS, BED, CARRIAGES, OR PLAY PENS. THIS BAG IS NOT A TOY.

3. Tissue

***WARNING: To avoid danger of suffocation, keep  
this bag away from babies and children.***

4. Bottom One

**WARNING:** To avoid danger of suffocation, keep  
this plastic bag away from babies and children.

5. Bottom Two

**WARNING:** TO AVOID DANGER OF SUFFOCATION, KEEP THIS PLASTIC  
BAG AWAY FROM BABIES AND CHILDREN. DO NOT USE IN CRIBS,  
CARRIAGES, OR PLAY PENS. REUSE OR RECYCLE THIS BAG.

MADE IN USA