Enhancing Information Acquisition for Over-the-Counter Medications by Making Better Use of Container Surface Space

Michael S. Wogalter, Amy Barlow Magurno, David A. Dietrich, and Kevin L. Scott
Department of Psychology, North Carolina State University, Raleigh, North Carolina, USA

*Most over-the-counter (OTC) pharmaceutical container labels are printed in very small type. Consequently, people with visual impairments (e.g., presbyopia in older adults) have difficulty reading the material. Some OTC drugs are packaged in containers with easy-open caps. This design increases the surface area that could be used to enhance the labeling. In Experiment 1, older adults (*M *= 75.1 years,* SD *= 8.1) evaluated six container label variants for an actual OTC product. Besides having a multipanel main label, four containers had labels attached to the cap that displayed the most important information in large print but differed in color. Two control containers lacked a cap label; one had only a four-panel main label, and the other had only the front label. Participants ranked the containers on six dimensions (e.g., label noticeability, willingness to read). Results showed greater preference for containers with the cap labels. Experiment 2 again examined preferences but also measured information-acquisition performance after participants (*M *= 79 years,* SD *= 5.8) were briefly exposed to a realistic-appearing, but fictitious, OTC medication. Results showed greater knowledge and preference for containers with the cap labels. Experiment 2 showed that one of the cap colors (yellow) that was different from the main label was preferred over the white and orange (the same colors as on the main label), but color distinctiveness as an explanation was not fully supported because the green cap was not significantly different from the other cap labels. Implications for communicating information about OTC drugs using expanded labels are discussed.*

Received 11 September 1996; accepted 31 January 1998.
The authors wish to thank the retirement community residents who participated in this research. Portions of this article were presented at the 39th and 40th Annual Meetings of the Human Factors and Ergonomics Society (Wogalter & Dietrich, 1995; Wogalter, Magurno, Scott, & Dietrich, 1996).
Address correspondence to Michael S. Wogalter, Department of Psychology, 640 Poe Hall, Campus Box 7801, North Carolina State University, Raleigh, NC 27695-7801, USA. E-mail: Wogalter@Poe.coe.ncsu.edu

Experimental Aging Research, 25: 27–48, 1999

0361-073X/99 $12.00 + .00

Pharmaceutical products sold over-the-counter (OTC) in the United States generally have labels displaying directions for use, contraindications, warnings, and other information. The information may be on the container itself, on inserts, or on exterior packaging. The purpose of this information is to inform people about the appropriateness of the medicine for their condition. Sometimes the only way for consumers to learn about the characteristics of OTC medications is from the information included with the product.

The current strategy used to label OTC products is to load them with substantial amounts of information to cover most of the possible uses, misuses, and risks associated with the medication. In order to provide a complete set of relevant information, most OTC labels contain considerable information so that the text size must be substantially reduced to fit the surface area of the container or packaging. However, this policy frequently produces text in small print that is illegible for many of the people who use the products. Individuals with visual impairments can have difficulty reading the reduced print (Vanderplas & Vanderplas, 1980 ; Zuccollo & Liddell, 1985). Older adults, who tend to have age-related visual impairments (e.g., presbyopia, cataracts), are also likely to take more medicines than other age groups. Thus, consumers with age-related visual conditions can have problems reading important information about the drugs they take.

In recent years research has begun to examine various factors that influence the usability of drug information, and in particular has focused on older adult consumers. This research has mainly concerned prescription drug information, and has shown that the text structure or organization based on users' schemata (mental models) facilitates comprehension and recall of the material (Morrow, Leirer, & Altieri, 1995 ; Morrow, Leirer, Altieri, & Tanke, 1991 ; Morrow, Leirer, & Sheikh, 1988 ; Vigilante & Wogalter, 1997). Support aids intended to facilitate information usability, such as pictorials and icons added to text (Morrow, Leirer, & Andrassy, 1996 ; Morrell, Park, & Poon, 1990 ; Sojourner & Wogalter, 1997) and external organizers (Park, Morrell, Frieske, & Blackburn, 1991 ; Park, Morrell, Frieske, & Kincaid, 1992) have been examined. These studies have shown mixed but promising success in facilitating comprehension and recall of drug information. Surprisingly, there is very little research on ways to enhance the initial stages of information processing of the labels, that is their attention-gettingness and legibility. Clearly, consumers must notice and be able to read the label in the first place in order to set the stage for the next set of processes such as comprehension of the material and compliance motivation. Watanabe (1994) noted that part of the problem with older adults being less able to read the labels of OTC pharmaceuticals is due to font characteristics and sizes that are used.

OTC pharmaceuticals are among the most complex products available on the market place. Unlike some kinds of consumer products that are available for purchase by consumers, the proper ways to consume and the potential risks (inherent and as a consequence of inappropriate use) are not readily apparent just by looking at the product. That is, one cannot tell by just looking at a small white pill what the hazards are. The hazards are "hidden"—they are not "open and obvious." Thus, in order to have knowledge about proper use and potential risks, this knowledge must be acquired from information provided with the product or from outside sources.

Some OTC pharmaceuticals include patient-product inserts (PPIs) as part of the package materials. These enclosures lack the space constraints of the container label and could be designed so that the printed information is more legible (e.g., using a larger font) and more understandable (e.g., with simplified language). In addition, many OTC products include exterior packaging such as a cardboard box surrounding the medicine container itself. Like the PPIs, the outside packaging material's surface area could be used to make the total information system more complete and easier to read and understand. Also, PPIs and exterior packaging materials can potentially serve different purposes. For example, the information on the exterior packaging can assist purchase decisions, and the PPI can serve as a more complete reference source. Frequently, however, the information on both the PPI and the exterior package is nearly identical in form and content. So although both provide additional space that could be used to make the print larger and to display more complete and usable information, this is seldom done. Moreover, these separate and unattached items are frequently discarded after initial use of the product, and so they may be of little assistance to the consumer when the product is used at a later time (Wogalter, Forbes, & Barlow, 1993).

One possible solution to this labeling-communication problem is to enlarge the surface space of the container and/or its label, thereby enabling greater legibility of the print, permitting expanded instructions and warnings, and avoiding the problems of missing PPIs and exterior packaging. In one study (Wogalter & Young, 1994), the surface area of a small glue container was expanded by incorporating an extended tag label. The tag allowed the use of larger print sizes than the original label. Results showed that compliance behavior (wearing protective gloves) increased with the tag label compared to a control label without the tag. Barlow and Wogalter (1991) and Wogalter et al. (1993) found that older adults preferred glue containers having labels with increased surface area. One of the bottle designs most preferred by the older adult population was a "wings" design (having fins coming out from the sides of the bottle) that not only provided more surface area—enabling the size of the print to be made larger—but also made it easier to hold and turn the cap.

Recently, several drug manufacturers have begun to package OTC pain medications in easy-open containers with caps having extended fins. This new design makes it easier for someone with arthritis or with a hand/arm disability to open the container. An important disadvantage to the easy-open cap, however, is that it also makes the containers easier for children to open compared to child resistant containers for the same medicines. The only guard against access by small children is a small warning stating that the container is not child resistant and the standard "Keep out of reach of children" directive.

Notwithstanding its child-resistance problem (which could be corrected), this new easy-open container design also increases the usable surface area of the container (relative to other similar capacity medicine containers). Utilization of this area could allow the printing of larger and better instructions and warnings.

The present research examines whether making use of this added surface area to reprint and extend some of the most important warnings and directions on the available space of the container cap is beneficial. One of the issues addressed in this research was whether older adult participants would prefer information labels on the caps of OTC medication containers. Additionally, the cap labels varied with respect to color, and the issue examined here was whether a cap label with a color different from the colors of the main label would affect participants' preference. A distinct color could make the cap label more noticeable (salient) and thereby might be preferred over cap labels that are less distinct from the main label. In Experiment 1, the product used was an actual store-bought OTC medication that is familiar to most older adult consumers. In Experiment 2, preferences for different label versions were again examined but the study employed a less familiar (fictitious) OTC medication. In addition, Experiment 2 examined knowledge acquired after brief exposure to one of the labels. Additional details about Experiment 2 are provided later.

EXPERIMENT 1

Experiment 1 examined preferences for different container label variants for a common OTC medication. Factors manipulated were: (1) the presence or absence of back and side labels, (2) the presence or absence of the cap label, and (3) cap label color (white, orange, fluorescent green, and a two-toned version with the signal-word header in orange and all other warning text in white). The purpose of examining the first two factors was to determine whether information-display method would affect older adults' drug-container preferences. Specifically, the first comparison addressed whether it mattered to participants whether the container had the (rather considerable amount of) text found on the back and side label sections. For example, if participants were unable to read the material on the back and side labels at all, these labels might be considered to offer little or no utility and as a result, preference judgments for the two control conditions might not differ. The second information display factor was examined to determine whether the cap label was perceived to offer a benefit over and above the conventional product label. Color was manipulated to determine whether certain colors would make the cap label more salient as compared to other colors that repeated the main label's colors on the store-bought bottle. For one cap label, a fluorescent green was used that was distinctive from the rest of the colors on the main label. In another cap label, a two-color style specified in the ANSI (1991) Z535.4 standard for consumer product warning labels was used. These were compared to single-color cap labels with hues (white or orange) that corresponded with the predominate colors on the main label.

Method

Participants

Sixty residents (19 males and 41 females) of retirement communities in North Carolina and Virginia participated. Participants had a mean age of 75.1 years ($SD = 8.1$) and a mean education of 14.8 years (2.8 years post high school). Fifty-five participants (92%) were wearing corrective lenses and two participants (3%) reported being color blind. The study was approved by North Carolina State University's Institutional Review Board.

Design and Stimulus Materials

Six label configurations were examined in a within-subjects experimental design. All were based on the bottle and label for a national brand ibuprofen pain reliever (Motrin IB, The Upjohn Co., Kalamazoo, Michigan). Two were controls. One control was a bottle and label identical to Motrin IB (130 tablet size) as it is sold in stores. It had a multipanel main label (front, back, and sides) that was attached around the body of the container. The other control was identical to the first except that the back and side labels were detached, eliminating most of the on-container warning/instruction text.

The most prominent colors of the container and main label were orange and white. There were also two small sections (less than 5% of the available surface) with the colors yellow or brown. Most print was in black.

The other four label conditions were identical to the store-bought control (with the complete multipanel main label), but they also included warning material on the cap section. The information on the cap label is shown in Figure 1. This label included: a signal icon (triangle enclosing an exclamation point) and the signal word WARNING. The text emphasized the containers' lack of child resistance and provided some of the most important directions for use and warnings found on the main label as well as two additional pieces of information from the 1993 edition of the *Physicians' Desk Reference* (*PDR*). The additional information consisted of cautions to consult a physician if they have experienced bleeding from using aspirin or if they have blurred vision. The choice of information included on the label was based on an assessment of importance by a pharmacist. The purpose of including the additional information was to improve overall label quality by correcting existing content deficiencies.

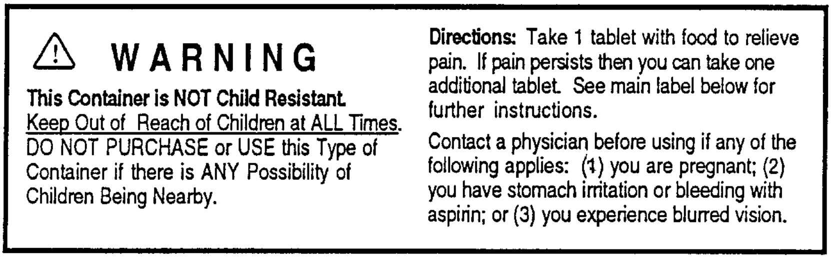

FIGURE 1 The printed material on the experimental container cap labels.

The added label message was printed in 10-point New Helvetica Narrow, a sans serif font chosen for its similarity to the font-style used on the store-bought label. The signal word, the not-child-resistant message, and the directions heading were printed in a bold version of this font. The signal word was printed in 17 points. The existing (predominately orange) main label on the body of the container (front, side, and back) had sans serif type of various sizes, but most of the label (including directions, warnings, indications, etc.) was printed in 4-point type.

A depiction of the containers' configuration is shown in Figure 2. Without the cap, the bottom portion of the container had a physical height of 7.6 cm and a width of 4.0 cm. The cap circum-

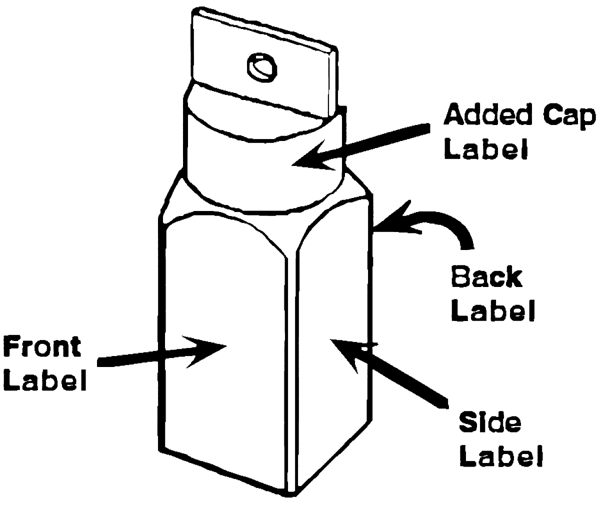

FIGURE 2 Representation of the container and label placement.

ference was 13.5 cm and the cap height was 2.4 cm with an additional 2.2 cm projection or fin.

The four cap conditions differed only with respect to the color of the cap label: white, orange, orange/white, and green. The orange and white colors on the cap were similar to the colors on the main container label. The green was a bright fluorescent color. The cap label combining both orange and white was designed to be similar to the warning panels described in an existing standard for consumer product warnings, ANSI (1991) Z535.4. This label was identical to the white experimental cap label except that the rectangular panel enclosing the signal icon and signal word was orange.

The cap labels were produced using a 600-dpi laser printer and laminated to the white plastic container caps. Questionnaires given to participants are described in the next section.

Procedure

Each participant was run individually in a separate session. Participants read and signed a consent form before beginning the study, and then were given a short questionnaire that requested information about personal demographics (e.g., age, gender, education, use of corrective lenses). Participants were then presented with the six medicine bottles and a questionnaire that asked them to order the bottles on each of the dimensions listed below (from most or best = 1 to least or worst = 6):

- How easy is it to read the label?
- How likely would you be to notice the warnings on the label?
- How likely would you be to read the warnings on each label?
- Please rank your preference for each of the labels.
- How likely would you be to recommend each label to a friend or family member?
- How likely would you be to purchase each version of this product?

The order of questions was randomized for each participant. Before each question, the containers were arranged in a random sequence by the experimenter who then recorded the order of each of the participants' orderings on a response sheet. After completing these tasks, participants were debriefed and thanked.

Results

The first analysis showed that participants tended to arrange the bottles in the same order for all six questions. In fact, Spearman rank-order intercorrelations among the questions and label means were extremely high, ranging from .95 to 1.0. To simplify subsequent analysis and presentation of the results, the data were averaged across questions producing one score for each of the six bottle labels for each participant. This derived score is indicative of overall preference. Means of these scores, across participants, are shown in Table 1.

The data were analyzed with a Friedman test (a nonparametric test for multigroup repeated-measures designs), which showed a significant effect of label condition, $\chi^2(5, N = 60) = 225.78$, $p < .0001$. As can be seen in the table, the preferred designs were those with the added cap label. The most preferred was the green cap, followed by the orange, the orange/white, and then the white cap label. The store-bought control was ranked fifth and the control with no back or side labels was ranked last by all participants. The Wilcoxon's matched-pair signed-rank test showed that each of the label conditions differed significantly from one another ($p < .05$), except between the green and orange labels and between the orange and orange/white labels.

Discussion

The results showed that older adult participants judged the containers with the added cap label more positively than the currently-sold container design which lacks the cap information (or a bottle without any information on the back and size labels). Participants significantly preferred the control container with the

TABLE 1 Mean Preference Ranks (and Standard Deviations) of Bottle Label Configurations (Experiment 1)

	Control (no cap label)		Multipanel with cap labels			
	Front panel only	Multipanel	White	Orange/ white	Orange	Green
Overall Preference						
M	6.00	4.99	3.13	2.57	2.32	1.99
SD	0.00	0.09	1.06	1.02	0.97	1.05

Note. These data are averaged across questions. Lower scores indicate greater preference.

multipanel label (without the cap label) over the control container with the front label only. These results suggest that the participants preferred having more rather than less information on the container.

The results also suggest that making use of added surface area on a container can enhance people's preferences. Effective use of this surface space can make the displayed information more noticeable, legible, etc. These results support those of Barlow and Wogalter (1991) and Wogalter et al. (1993) who found strong preferences for glue bottles having labels with increased surface space for larger print warnings. Increasing the available printable area could also allow the inclusion of pictorials that could enhance salience and comprehension of particular warnings and instructions (Kalsher, Wogalter, & Racicot, 1996).

The data also indicate that participants preferred the cap label versions with color compared to the white cap label. The green cap received the best mean rank scores although it was not significantly different from the orange color cap, which repeated the predominant color of the main label. Two explanations can be offered for the green-preference trend. One is that this particular hue is more noticeable as it is a bright fluorescent version of this color. An alternative explanation for the trend is that the green label is simply a different color than the rest of the label. Unfortunately, it cannot be determined from these data how other hues (e.g., a blue or yellow) would be evaluated.

Preference for the ANSI-style orange/white label was lower than expected, given that this is an established standard design for warning labels. Its rank was significantly lower than the green label and not different from the orange-only label. Nevertheless, it was preferred over the white-only label. The orange/white label's position between the orange-only and white-only caps suggests that preference was based on the amount of color.

One possible concern about the present results is that the cap labels contained some information not on the main label (to correct deficiencies on the actual manufacturer's label) and that this extra information might have biased the preference results in favor of the bottles with the supplemental cap label. We do not believe that participants noticed that the cap labels had the extra information. However, even if they did notice it, the major point of the study was to show that making better use of existing surface area produces greater preferences. The data support this finding and it is not negated by slight informational differences between the cap versus noncap label conditions. This concern notwithstanding, the next experiment controls for this potential factor.

EXPERIMENT 2

In Experiment 1, preferences for various OTC label configurations were assessed. However, it did not address whether the supplemental labels and colors actually benefit users. Thus, one limiting factor of the first experiment is that it only showed subjective differences, not performance differences. Sometimes, what people report is not consistent with reality. These preference judgments may not reflect actual performance advantages for these labels. The issue, therefore, is whether the cap labels actually lead to better information acquisition compared with conventional labels.

One way to assess differences in performance is to determine comprehension after brief exposure to the label. However, a pilot test using this brief-exposure method with the stimuli from Experiment 1 failed to show differences among the six label conditions. In this pilot research, high levels of product knowledge were found in all conditions, suggesting the presence of a ceiling effect. This ceiling effect was probably due to the older adult populations's high level of familiarity with this particular medication, a common OTC pain reliever. Experiment 2 employed a less familiar OTC product that was fictitious (but based on a real medication) in an attempt to reduce the likelihood of a ceiling effect by decreasing the influence of preexisting knowledge that might mask differences between versions of the container labels.

Thus, Experiment 2 extends the first experiment by examining the effect of the supplemental cap label and its color by addressing whether the supplemental label facilitates performance in a knowledge-acquisition task and whether color adds to this effect. Additionally, Experiment 2 reexamines the preference findings of the earlier experiment by examining whether color distinctiveness is responsible for the finding of increased preference for the green cap.

It was expected that the bottles with supplemental cap labels would produce greater knowledge about the medication and be preferred to bottles without supplemental labels. Two distinctive cap colors (fluorescent yellow and fluorescent green) were expected to produce greater knowledge because they would draw attention to the material and would be preferred over a fluorescent orange cap label that matched the primary color of the main label.

Method

Participants

Seventy-five volunteers from a relatively affluent retirement community in Chapel Hill, North Carolina, participated. Participants in this study did not take part in Experiment 1, and all were independently functioning residents of their community. Mean age of participants was 79 years ($SD = 5.8$, ranging from 69 to 90), 77% were females, and all were Caucasian. Mean educational level was 17.0 years (5 years post high school). The mean number of medical conditions reported was 2.5 ($SD = 1.3$). Four participants (5%) reported being color blind and 70 participants (93%) wore corrective lenses. A monetary contribution was made to the community fund in appreciation for residents' participation. The study was approved by the Institutional Review Boards of North Carolina State University and the retirement community.

Materials

A store-bought bottle of the pain reliever Datril (Bristol-Myers Co, New York, NY), a brand-name acetaminophen product, was used in a trial run of the knowledge-acquisition procedure to acquaint participants with the main experimental procedure.

For the main experimental trials, "Marvine," a fictitious OTC motion sickness preparation, was created. Most people, including older adults, are unfamiliar with motion sickness medications relative to other kinds of highly-advertised OTC drugs (Vigilante & Wogalter, 1997). An unfamiliar product was used to limit the possibility that pre-existing knowledge about the drug would enable participants to answer many of the questions on the knowledge test without having been exposed to the experimental labels (creating a ceiling effect). Although the product was fictitious with respect to active ingredient and manufacturer, the text on the labels was constructed to be plausible and realistic, containing information from currently available motion sickness preparations and information from the *PDR* (1993).

The Marvine bottle was similar to the easy-open container shown in Figure 2. The main label (front, back, and sides), shown in Figure 3, was attached around the container's body. Formatting

MARVINE

(Promethazine Dimenhydrinate)

For nausea, dizziness, & motion sickness

No Prescription Needed

PACKAGE NOT CHILD RESISTANT

100 TABLETS 50 mg each

DO NOT USE IF PRINTED PLASTIC OVERWRAP OR FOIL INNER SEAL IS BROKEN

WARNINGS: DO NOT TAKE THIS PRODUCT, UNLESS DIRECTED BY A DOCTOR. If you have a breathing problem such as emphysema, asthma, shortness of breath, or chronic bronchitis, if you have glaucoma, if you have sleep apnea (periods when breathing stops), or if you have difficulty in urination due to enlargement of the prostate gland. May cause marked drowsiness, dryness of the mouth, or temporary blurring of the vision. Other possible effects include disorientation, memory disturbances, dizziness, restlessness, hallucinations, confusion, headaches, ringing in ears, difficulty urinating, skin rashes or redness. Do not drive, operate dangerous equipment, or participate in activities that require full mental alertness while taking this product. Do not take this medication if you are pregnant or nursing a baby, have (or have had) any metabolic, liver, or kidney disease, have any obstruction of the stomach or intestine, have any skin allergy or have had a skin reaction to any drug or chemical or food substance—unless directed by your doctor. Keep this and all drugs out of the reach of children. Children and the elderly may be particularly sensitive to the effects of this medication. Marvine should not be used in children under 8 years of age. The safety and effectiveness of this product for use in children has not been determined. Seniors (over 60) may be more likely to experience dizziness, drowsiness, confusion, overstimulation, or lowered blood pressure. Not for frequent or prolonged use except on the advice of a doctor. Do not exceed the recommended

DRUG INTERACTION PRECAUTION: Do not take this product if you are taking sedatives, sleeping medications, tranquilizers, or MAO inhibitors without first consulting your doctor. Also avoid alcoholic beverages while taking this product, as the effects of alcohol may be intensified and the action of the Marvine may be changed.

INDICATIONS: For the prevention and treatment of nausea, dizziness and vomiting associated with motion sickness due to car, boat, or airplane travel, or to amusement park rides. Marvine is a H1 histamine receptor blocker. It exhibits its action by an effect on the Central Nervous System, possibly by its ability to block muscarinic receptors in the brain. In addition to its antihistaminic action, it provides clinically useful sedative and antiemetic effects.

DIRECTIONS: To prevent motion sickness, the first dose should be taken one half to one hour before starting activity. ADULTS: 1 to 2 tablets every 4 to 6 hours, not to exceed 8 tablets in 24 hours, or as directed by a doctor. CHILDREN 8 TO UNDER 12: 1/2 to 1 tablet every 6 to 8 hours, not to exceed 3 tablets in 24 hours, or as directed by a doctor.

ACTIVE INGREDIENT: Each tablet contains promethazine dimenhydrinate 50 mg.

INACTIVE INGREDIENT: Corn and potato starch, dextrin, lactose, and magnesium stearate

STORAGE: Keep below 86 F (30 C) in a dry place and protect from light.

dosage; overdose may cause serious consequences such as death. Symptoms of overdose include breathing difficulties, flushing, loss of consciousness, very low blood pressure, stomach and intestinal problems. In the event of overdose, seek professional medical assistance or contact a poison control center immediately.

If you have Questions or Comments: Call us toll free at 1-800-535-1726 between 9 AM and 5 PM Eastern Time.

Lincoln Pharmaceuticals Inc.
Marcon, MA
Made in USA

Lot [illegible]

Expiration date: 5/95

Patent 7,613,121

FIGURE 3 Text of the multipanel main label (front, back, and sides).

of the text on the main label was designed to be similar to other OTC medications currently on the market. The front panel contained the product name, chemical name, indications for use, and other typical principal display panel information. The print sizes on the front label ranged from 7- to 14-point black type. On the back and side panels, type size (4 point) was the same letter height as is found on other commercially-available OTC products (e.g., Motrin IB, used in Experiment 1). The main label background color was fluorescent orange.

The two control conditions were similar to those in Experiment 1. One had only the front label attached to the bottle (i.e., it lacked the back and side panels). The other (conventional multipanel) control had the complete main label around all four sides of the bottle but lacked the supplemental cap label.

Three other bottles had the same main label as the conventional multipanel control, with identical label content, but also displayed a supplemental cap label. Information displayed on the cap label was selected from information on the main label and was chosen, based on consultation with a pharmacist, to reflect the most important cautions and directions for proper, safe use of a motion sickness product. The textual content and layout of the three cap labels was identical, with the caps varying only in the background color of the label: orange, yellow, or green. All were fluorescent hues. The orange cap label was identical to the background color of the main label. The cap label text was black print, in New Helvetica Narrow font, having type sizes ranging from 7 to 17 point.

The supplemental cap labels were composed of three sections. One section was positioned on the front extended tab (fin) of the cap, a part of the cap not used in Experiment 1. This section contained the signal word (WARNING) and the signal icon (an exclamation point surrounded by a triangle). The other two sections of the cap label completely wrapped around the base of the cap so that one part faced the front and the other part faced the back of the bottle. Important cautions were printed on the front and dosage information on the back. The text of these labels is shown in Figure 4.

All labels were produced on a 600-dpi laser printer. The labels were attached to the bottles and laminated with clear plastic for durability and a realistic appearance.

A medication knowledge test was developed from information on the Marvine label. The 12-item test (with a total of 42 subparts) consisted of open-ended and probe-type questions concerning what the drug treats, when and how much of the drug to take, when not to take the drug, signs/indications of overdose, side effects, whether the drug can be given to children of various ages, and the bottle's adequacy of child proofing. The test was administered in an interview format, with the experimenter writing down the participant's response to each item.

Procedure

The study was conducted in a conference room at the retirement community. Participants arrived at prearranged times and were tested individually. The experimenter explained to participants that the purpose of the study was to investigate their impressions of labels on medicine bottles. Participants were told they would be shown drug containers, and then would be asked questions about the medications. Participants signed a consent form before beginning the study.

The first phase of the study was a trial run intended to acquaint participants with the type of task they would be performing in the main experiment. The experimenter read aloud a scenario in which participants were to assume they were shopping for a pain reliever to be used by family members of various ages and with various medical histories. They were asked to read the label for information on how to use the product and on who should or should not take it. The participant was handed a Datril bottle, and after 60 s, the bottle was removed, and the participant was asked three questions about the product's use by children, by

⚠ **WARNING**

Container is NOT Child Resistant.
Keep Out of Reach of Children at ALL Times.

CAN CAUSE DROWSINESS.
Do not take with alcohol or other drugs as the effect may be intensified.

CAUTION. **Before using, see a physician if you are:** (1) pregnant or nursing a baby; (2) have any of the medical conditions listed on the main label (such as breathing difficulties, glaucoma, sleep apnea, enlarged prostate, liver/kidney disease, skin allergy); or (3) are taking sleep aids, sedatives, tranquilizers or MAO inhibitors.

Directions: Take 30 to 60 minutes before starting activity. *Adults*: Take 1 to 2 tablets every 4 to 6 hours, but no more than 8 in 1 day. *Children (8 to 12 years)*: 1/2 to 1 tablet every 6 to 8 hours, but no more than 3 in 1 day. Do not give to children under 8 years. Doctor may advise other dosages.

FIGURE 4 Text of the supplemental cap label.

someone allergic to aspirin, and by someone with a peptic ulcer. Responses from this phase were recorded but not analyzed.

In the second (main experimental) phase, another scenario was presented to participants. They were asked to assume they were buying a motion sickness medication in preparation for a one-day bus trip on winding mountain roads. Further, they were to assume that fellow travelers would have a variety of medical conditions and would be of different ages. The purpose of the scenario was to provide realism as well as relevance to encourage careful examination of the label for a broad range of purposes. Each participant was then presented with one of the five Marvine bottles (depending on the condition to which they were randomly assigned) and asked to examine the label so that they could later answer questions on the medication. After 3 min had elapsed, the Marvine bottle was removed and the knowledge test was given. Participants were encouraged to give answers to all the questions, based on the information viewed on the label and any background knowledge they had regarding motion sickness medications. The request to use background knowledge in answering the questions is a more ecologically valid assessment of comprehension than simple recall of the material just viewed. Indeed, prior knowledge is probably used in virtually all naturalistic decision-making tasks. Also, this procedure enabled a valid comparison with the control condition that lacked the back and side panels. The comparison of the two control conditions assesses the effectiveness of the conventional label in terms of information acquisition over and above preexisting background knowledge.

In the final phase, participants were given all five bottles of Marvine and asked to rank the bottles from most preferred to least preferred. In this single preference evaluation, participants were told to consider multiple criteria: overall effectiveness in communicating important medication information, ease in reading, likelihood of reading, and likelihood of purchase. Later, participants were debriefed and thanked.

Results

Knowledge Test

Each subpart item of the knowledge test was scored as correct = 1 or incorrect = 0. Data analysis used the mean proportion correct score for each participant (based on a total of 42

TABLE 2 Mean Knowledge and Preference Rank Scores (and Standard Deviations) of Container Label Configurations (Experiment 2)

	Control (no cap label)		Multipanel with cap labels		
	Front panel only	Multipanel	Orange	Green	Yellow
Knowledge					
M	0.15	0.38	0.57	0.51	0.55
SD	0.11	0.23	0.15	0.16	0.12
Preference rank					
M	4.97	3.85	2.33	2.05	1.79
SD	0.16	0.69	0.88	0.77	0.86

Note. Higher knowledge scores indicate better performance and lower preference rank scores indicate greater preference.

subpart items). Prior to analysis, a second judge rescored the open-ended responses. Interrater reliability (calculated as number of agreements/total $\times$ 100) was nearly perfect (99.75%).

The mean proportion correct knowledge scores are shown at the top of Table 2. A one-way between-subjects analysis of variance showed a significant effect of bottle label conditions ($F(4, 70) = 17.82$, $MSE = 0.025$, $p < .0001$). Because certain differences between conditions were of interest, a set of a priori (planned) comparisons were made among the relevant group means (Keppel, 1991 ; Winer, Brown, & Michels, 1991). These comparisons showed that exposure to the three cap label bottles produced significantly higher knowledge scores than the two control label bottles ($p < .05$). The three cap labels did not differ among themselves ($p > .05$). Between the two controls, the multipanel label produced significantly higher knowledge scores than the front panel only label ($p < .05$).

Preference Ranks

Mean preference ranks for the five conditions are shown at the bottom of Table 2. Lower rank means indicate greater preference. The data were analyzed using the nonparametric repeated-measures Friedman test. This test showed a significant effect of label condition ($\chi^2(4, N = 75) = 223.05$, $p < .0001$). Paired comparisons were performed using the Wilcoxon matched-pair signed-rank test. Among the cap labels, yellow was most preferred, receiving significantly lower ranking scores compared to orange

($p < .05$). Green was intermediate but did not significantly differ from the other two cap label colors ($p > .05$). All three cap label conditions were judged to be significantly better than the two controls ($p < .05$). The multipanel control label was significantly preferred over the front panel only control ($p < .05$).

Discussion

This experiment showed that reprinting the most critical information from the main label in a larger, more visible format was beneficial. In particular, the addition of a supplemental cap label promoted greater knowledge acquisition than the conventional label alone. Making better use of available surface area of OTC containers helps.

The color of the supplemental label did not make a difference in knowledge acquisition scores, but did affect preference. The results showed that the yellow cap label was preferred over the orange cap label (which was also the color of the main label), with the green cap label intermediate between these two. This finding replicates a color-preference trend found in the first experiment. Unfortunately, the results of both studies were inconclusive about the green color and the distinctiveness hypothesis. In both cases, green was not significantly different from the orange cap label, despite green appearing to be highly distinctive with respect to the main label. The yellow label, which was also distinctive, produced significantly higher preferences than the orange label. This yellow preference could be due to various causes or combination of causes (e.g., is it because it is yellow ; is it because it is a fluorescent yellow ; is it because of a particular contrast with the color on the main label, etc.). Thus, the pattern of results and the conditions involved in the experiment cannot provide a firm conclusion on the color-distinctiveness issue. At this point, all one can say is that the yellow cap label was preferred. The reasons will need to be uncovered by research designed to systematically examine the different variations of colors on the main and cap labels to determine the parameters of people's preference.

As Table 2 shows, the pattern of means for both the knowledge and preference measures tended to correspond. Indeed the correlation for these five pairs of numbers are $-.96$ ($r^2 = .92$) ; it is a negative relation because the rank scores are reversed from the knowledge scores with respect to better labeling. Many behavioral researchers consider performance measures such as objective knowledge test scores to be superior to subjective preference measures. But as many marketing professionals know, factors such as appearance, color, and layout are often involved in people's selection and purchase of products and they play a role in the product's success in the market place. These features capture/attract attention and this sets the stage for the knowledge-acquisition process. It is therefore not surprising to see a high correlation between preference and knowledge acquisition for the container label conditions.

GENERAL DISCUSSION

Pharmaceutical products can benefit people's health but they also have risks. Because of the complexity of their effects on the body, considerable information about OTC preparations often needs to be communicated. However, the print size used for this information is frequently too small for persons with visual impairments to read. One way to enhance communication is to increase the available surface area of labels. The increased space could be used (1) to reiterate the most critical information, (2) to include information that might otherwise not fit on the label and which could elaborate on the textual descriptions or allow the incorporation of pictorials (Kalsher et al., 1996), and/or (3) to enable use of larger, more legible print (Barlow & Wogalter, 1991 ; Wogalter et al., 1993). The easy-open container used in this research is an existing design that provides additional surface area for this information—space that generally goes unused.

Both experiments show that the older adult participants preferred the containers with the supplemental cap labels over the containers without the cap labels. These results using both a familiar and a less familiar product indicate that the participants believed that such labels offer benefits. Using a performance measure, Experiment 2 showed that the supplemental label also provided the benefit of increasing knowledge about the medication. Participants who examined the containers with the supplemental cap labels were better able to answer questions about the medication than those who viewed a container without the cap label.

In Experiment 1, the information appearing on the cap label was extracted from the existing product label with the exception of two items which were taken from the *PDR*. Although this additional information could have affected participants' preferences in the first experiment, this was not an issue in Experiment 2, where all of the cap label information was drawn from the main label. Both experiments showed reasonably consistent preference results.

The present research also examined the effect of cap label color. In Experiment 2, no knowledge differences were found among the cap label conditions. One explanation for this noneffect is that all of the cap labels drew the attention of all or most of the participants, partly because of the unusual design and partly because, in some cases, it might have been the only section that they could read. The preference measures were inconclusive on the color-distinctiveness issue, with fluorescent green not significantly different from the orange (the main labels' color) in either experiment, but fluorescent yellow was preferred over orange in Experiment 2. It should be noted that this result should not be taken as a conclusive recommendation that fluorescent yellow should be used on extended labels. It is possible that another color would produce greater preference. It is also likely that the choice of colors depends on the main label color. Thus, consideration of various other factors is necessary when selecting colors. Systematic research on the combinations of colors used on various parts of the label would better define the important label-usability parameters.

The fact that the two control conditions (front panel–only vs. multipanel) differed for both knowledge acquisition and preference indicates that at least some of the older adults were able to read the information in the back and side panels or considered it potentially important to have available. This finding notwithstanding, several participants spontaneously commented that the back and side panels were very difficult for them to read. In fact, some reported that they were not able to read the back and side labels at all (and so the information contained in these panels was inaccessible to these individuals). Several participants also stated that they would be less likely to purchase a product if the print was too small for them to read, and a few noted that they routinely carry a magnifier with them. These comments, as well as other informal discussions with participants in the debriefing phase, suggest that being able to read labels is an important concern to older adult consumers, and that this need is not being met by many current OTC product labels.

There are other methods of extending the surface area of labels besides the one employed in the present research. Barlow and Wogalter (1991) illustrate several alternatives. Another method currently in the marketplace is a foldout label design found on some containers of Aleve (Procter & Gamble, Cincinnati, Ohio) pain reliever. By providing additional surface area, this label has the potential to offer benefits to older consumers. Direct attachment of the label to the container itself, as in these examples, avoids the pitfalls of methods like inserts and external packaging which might be discarded or lost after initial use of the product.

In the present study, we did not measure the visual abilities of our sample of participants, such as their acuity and contrast discrimination. These measures would be desirable in future labeling research to determine if preferences and knowledge acquisition are related to sensory/perceptual deficits. They would also allow comparison between studies with different participant samples.

There is also a need to investigate the effects of other potentially relevant factors including: (1) what information participants examine when they look at the labels, (2) how product familiarity and perceived hazardousness affect people's label reading, (3) how much consumers would be willing to pay for better product labels, and (4) whether enhanced labeling increases adherence to the medication instructions and warnings. Subsequent research in these areas will facilitate understanding of the factors that enhance people's knowledge about the pharmaceuticals that they take and to promote safer health-related behaviors. We hope that the present study's positive results using prototype alternative label designs will help to spur additional research in this area.

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