

THE EFFECTS OF PRINT FORMAT IN DIRECT-TO-CONSUMER PRESCRIPTION DRUG ADVERTISEMENTS ON RISK KNOWLEDGE AND PREFERENCE*

MICHAEL S. WOGALTER, PhD

Department of Psychology, North Carolina State University, Raleigh, North Carolina

TONYA L. SMITH-JACKSON, PhD

Graduate Department of Industrial and Systems Engineering, Virginia Polytechnic Institute and State University,
Blacksburg, Virginia

BRIAN J. MILLS, BA, AND CORRINA S. PAINE, MS

Department of Psychology, North Carolina State University, Raleigh, North Carolina

This research examined the effects of format in print direct-to-consumer (DTC) prescription drug advertisements in communicating benefit and risks. Print advertisements for six fictitious drugs were created. Each drug was manipulated on the basis of six conditions, differing on the basis of color and the integration or separation of the benefit and risk information. A sixth condition (control) lacked risk information. Participants were presented with the DTC advertisements. Performance on a subsequent knowledge test of benefit and risk information was measured. Later participants were shown six advertisements of a single drug advertisement each representing the manipulations and were asked to rank them on perceived effectiveness of communicating drug benefits and risks. Results showed that the presence of physical features (eg, color) that distinguish the risk information from other text facilitated knowledge acquisition and increased perceived effectiveness ranks. Implications for the presentation of print risk information in advertisements are discussed.

Key Words: Direct-to-consumer; Risk communication; Consumer knowledge; Design of medical information; Drug advertisements

INTRODUCTION

Background

IN 1997, THE Food and Drug Administration (FDA) published draft guidelines on how prescription medication information may be presented within advertisements in the print

and broadcast media directly to consumers. The finalized guideline (3) addressed prescription medication advertising (21 CFR 201, 202, and 610). As early as 1983, product-specific DTC advertisements for prescription drugs began to appear on the market (4). Prior to this, prescription drug marketing could only

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Reprint address: Michael S. Wogalter, PhD, Department of Psychology, 640 Poe Hall, Box 7801, North Carolina State University, Raleigh, NC 27695-7801.

*Portions of this research were presented at the 43rd Annual Meeting of the Human Factors and Ergonomics Society (2).

be directed to health care practitioners, pharmacy benefit managers, health and group plan insurers, and federal and state government agencies. Delivery of prescription drug information had been entirely based on the learned-intermediary doctrine. In the doctrine, medical specialists are primarily responsible for relaying relevant benefit and risk information about prescription drugs to patients. For a host of reasons, including the physicians' high workload and information complexity, the information conveyed to patients from physicians may not be communicated in a way that is understood and retained.

Prescription drug advertisements provide opportunities to present information to consumers in a format and at a frequency (via repeated viewing) that could provide information to consumers and potential consumers. However, poorly designed DTC advertisements could undermine effective communication of risk information. Despite the importance of ensuring that consumers are adequately informed about the medicines they may take, empirical research on the factors that influence the communication of information in DTC prescription drug advertisements is virtually nonexistent in the published literature. The purpose of the present research was to address the extent to which different presentation formats of information in prescription drug advertising in the print media affect knowledge acquisition.

DTC advertising of prescription medications can potentially support consumers' right-to-know and empower them to make informed decisions about their own health care. Previous studies by DiMatteo and Friedman (5) and a study conducted by *Prevention Magazine* (6) found that patients are more likely to comply with recommendations for use when the information is communicated directly and in an understandable manner.

Several of the concerns about prescription drug advertising relate to the potential biased presentation, deficient designs, and text that is difficult to understand (7). Biased presentation, in this case, refers to the relative manner in which benefit and risk information is

communicated. Federal regulations require an unbiased, balanced presentation of benefit and risk information related to drug therapy. Organizations such as the American Academy of Pediatrics (8) have expressed opposition to DTC advertising of prescription drugs. The basis of American Academy of Pediatrics' opposition is the concern that advertising will promote inappropriate demand for prescription drugs. This opposition may be based on the tendency of advertisers to present advertisements that are slanted toward benefit information, and/or the tendency of consumers to pay less attention to risk information, which is often presented in "fine" print (9). Consumers may underestimate the risks associated with prescription drugs, and this tendency may be due in part to limited knowledge. In research by Davis (10), consumers gave higher safety ratings to prescription medication advertisements with incomplete risk information compared to advertisements with more complete risk information.

The Steering Committee for the Collaborative Development of a Long-Range Action Plan for the Provision of Useful Prescription Medicine Information (11) made recommendations to the United States Department of Health and Human Services regarding how to communicate prescription drug information. Primarily, these recommendations were concerned with physician-to-patient communications, but the criteria provided are useful in helping to evaluate whether designs effectively communicate prescription medicine information. The steering committee recommended that written information should be specific, scientifically accurate, objective (unbiased in tone), legible, understandable, and useful. Useful written information is defined as: "... that which is sufficiently comprehensive and communicated such that consumers can make informed decisions about how to receive the most benefit from medicines and protect themselves from harm. Both the substance and presentation of the information are important" (p. 16). Research on the design of risk communications such as warnings has identified similar criteria for effective design. There is now a large body

of empirical research demonstrating the effects of various design formats on recall of information and compliance (12,13,14).

The present research examined the formatting of benefit and risks in printed DTC prescription drug advertisements. The basic premise is that the format of information (ie, the way the information is presented) and other design features can influence the magnitude and quality of information transfer (12). Pharmaceutical DTC information in mass-market print media mainly occurs in magazines and newspapers.

Two basic ways to present benefit and risk information are:

1. Prose text where benefit and risk information would be placed together, integrated in a single block or chunk of text, and
2. Text in which the benefit and risk information is separated in space into distinct groups.

Hartley (15) and Wogalter and Shaver (16) found that separated print represented by a bulleted format was judged as more appealing, easier to process, and more effective, compared to the same information presented in an integrated format. There are very few studies on text design and risk communication for warnings in product advertisements (17). The present research addresses the need for basic research on the topic.

Information Processing Theory

While there is not much research directly on the factors that influence risk communication in DTC drug advertisements, in particular, and in product advertisements, in general, there is existing theory that can suggest patterns of potential outcomes from the manipulation of the integrated versus separated presentation of benefit/risk information. Some information processing theorists (18) would predict that information presented as a coherent whole, such as integrated information, would better support information retrieval from memory through cued access. In other words, benefit and risk information presented

as a whole, could produce memory that can be retrieved by either benefit or risk cues.

However, previous research on the effectiveness of integrated or separated formats is inconclusive. For example, the principle of organizational grouping (19) could support integrated formats, since all of the pharmaceutical information relates to one grouping of critical information related to the prescription drug. However, it is also plausible that each component of benefit and risk information presents a different representation (meaning unit or processed unit) to the reader. If the representations are different, these components could be separated and presented in a coherent organizational grouping, which, in turn, could facilitate processing. Furthermore, integrated formats may interfere with information encoding into memory because the information looks too dense to attract readership.

Separated formats may require the reader to process and store the information separately, thereby leading to a more complicated process that can later cause retrieval difficulties (20). Additionally, separated information adds additional pieces that may compete for the user's attention, increasing mental workload, producing poorer memory, and reducing the subsequent likelihood that each cluster of information would be cued from the other. The structure linking the two concepts may be weaker because of the separation, reducing retrieval. Thus, it is possible that separating information into distinct groupings could disrupt the reader's ability to associate the information to produce a meaningful and accurate mental representation.

Risk communication research has identified other features besides layout or format that influence information salience. One of these is color. Color can assist consumers in differentiating some text from other text and consequently increase the likelihood that the reader's attention is drawn to the highlighted text. This could lead to better information transfer of that material. Previous research shows that increasing the salience of a warning message can increase comprehension and memory of the material (17,21).

The present research tested a total of six advertisement formats. A control format, consisting of no risk information, was included to benchmark participants' background (or preexisting) risk knowledge of the drugs. Using the control as the comparison condition, the other five formats can be assessed with regard to the amount of knowledge gained from exposure to risk information in the advertisements. Information layout (separated or integrated) and color (present or absent) were varied to produce four of the formats. Finally, the sixth separated/enhanced format consisted of adding a combination of features known to be useful in capturing people's attention (21) (These enhancements included the use of signal icon, signal word color panel, bolder stroke width of letter characters, and larger font size). Since these enhancements could not be employed easily in the integrated condition (positioned directly with the benefit information), the enhanced condition only appeared as a separated condition. With the combination of noticeable features, attention is more likely to be attracted, the material is more likely to be read, and knowledge is more likely to be acquired.

METHOD

Design

A repeated measures design was used with six conditions:

1. Control (no risks given),
2. Separated/no color,
3. Separated/color,
4. Integrated/no color,
5. Integrated/color, and
6. Separated/enhanced.

See Table 1 for descriptions of these conditions.

Person factors were also examined. One was population membership consisting of two levels, student and community volunteers. Other demographic variables examined were gender, age, and level of education. The

TABLE 1
The Six Conditions In the Experiment

1. **Control:** No risk information given in the advertisement
2. **Separated, No Color:** Risks and benefit are physically separate. All information has the same black font.
3. **Separated, Color:** Risks and benefit are physically separate. Risk information is printed in red.
4. **Integrated, No Color:** Risks and benefit are embedded within the same section of text. All information has the same black font.
5. **Integrated, Color:** Risks and benefit are embedded within the same section of text. Risk information is printed in red.
6. **Separated, Enhanced:** Risks and benefit are physically separate. The risk section was formatted based on the American National Standards Institute (ANSI) (1998) Z535.4 Consumer Product Warning Label Standard. This section is boxed containing a yellow signal-word panel on top with the word **WARNING** and an alert icon (triangle enclosing an exclamation point) in black ink with the risk text in bold font.

dependent variables were knowledge acquisition scores following exposure to the magazine as assessed by a test of recall of the advertised drugs' benefit/risks, and later, ranks of perceived effectiveness of the advertising formats for communicating risks.

Participants

A total of 144 individuals participated. Seventy-two participants were undergraduates recruited from introductory psychology courses at North Carolina State University. Another 72 participants were recruited from the Raleigh-Durham geographic area. Half of the participants in each group were female. The students (age $M = 19.4$ years, $SD = 1.7$) participated for course credit in their introductory psychology courses. The community volunteers (age $M = 29.9$ years, $SD = 11.5$) came from various community organizations in the area and were compensated with nominal gifts for their participation. None of the participants had sufficient medical knowl-

edge to recognize the advertisements as fictitious.

Materials

A simulated magazine was constructed containing articles and advertisements for a variety of products. Advertisements that were not related to prescription medications were all presented in color. The magazine (*Raleigh: The Magazine of the Triangle*) contained full-color and black and white advertisements of different sizes for various products/services. The magazine also included articles about social and leisure activities and cultural arts in the local capital city area. The full-page professional quality drug advertisements were interspersed throughout the magazine and consisted of information derived from real drug advertisements and a *Physicians Desk Reference*. In addition, six fictitious medications with specific benefits for a particular health condition were presented as advertisements within the magazine (Table 2). The advertisements were rotated through all conditions an equal number of times across participants using two balanced Latin Squares (36 combinations of advertisements and conditions). Participants saw all six drug advertisements, but each advertisement represented a different design format.

The four formats were manipulated with regard to risk placement and color in the advertisements. The control advertisement lacked the risk statements. The separated conditions advertisement displayed the risks

in a separate section from the benefits. The integrated conditions displayed the risks in the same section as the benefit. The risks were either in the same ink as the rest of the print in the advertisement or in different color ink (red). The separated/enhanced condition advertisement was based on the format prescribed by the ANSI Z535.4 (22) consumer product warning standard. The risks in the separated/enhanced condition were contained in a box with a black and yellow striped border with a signal word panel on top that contained the alert icon (triangle enclosing an exclamation point) and signal word WARNING in a yellow background. Additionally, the text message in the enhanced condition was in larger bold print. The format of presentation was different for each experimental condition, but all wording and graphics were identical across all conditions (except for the control advertisements, which lacked the risk statements, and the enhanced/separated advertisements, which had the added features described above).

As an example, the following box shows the risk statement for one of the fictitious drugs, Breath-Ease DX.

The most common side effects are throat irritation, stuffiness, and nosebleeds. Notify your doctor of other medications you are currently taking.

The following box shows the benefit statement for Breath-Ease DX.

Breath-Ease DX treats nasal inflammation, which is caused by allergies. It prevents nasal passages from becoming swollen due to breathing allergens in the air.

TABLE 2
The Fictitious Drug Names
and Their Described Uses

Drug Name	Indications
Anxiolave	Anxiety relief
Breath-Ease	Nasal spray
Cardeziem	Lowers high blood pressure
Dermabrite	Topical wrinkle cream for the face
Fungarox	Toenail fungus/anti-fungal
Lenoxin	Allergy relief

Questionnaires

There were several printed questionnaires that the participants completed. The first was a consent form that, because of the nature of the study, did not tell the true purpose of the study (though participants were thoroughly debriefed later). The second was a demographic questionnaire that asked age, gender, population (student or community), and high-

est education level attained. A third questionnaire was a rating sheet with numbered blanks used by participants to evaluate the magazine pages. A fourth questionnaire was a knowledge acquisition test comprised of open-ended questions asking participants to list the main benefit and all of the possible risks of the advertised drugs, and in doing so, to be as detailed as possible. A fifth response sheet was used to record the participants' rank orders of advertising formats.

Procedure. After consent forms were signed, participants completed the demographic questionnaire. To assess knowledge acquired from incidental exposure, participants were not informed of the study's true purpose at the beginning of the experiment. Rather, they were told it was a marketing research study about the magazine's attractiveness. This method provided a more externally valid measure of knowledge acquisition than a procedure that gave cues about the study's actual purpose, in which participants may be biased into intentionally studying the drug advertisements. The potential benefit of this approach outweighs the risks of nondisclosure, particularly when participants were told the true nature of the study some 30 minutes later, and no harm occurred in the interim.

The study's procedure is similar to a method employed by Barlow and Wogalter (17) to investigate the effectiveness of warnings in alcohol beverage advertisements. In lieu of initial disclosure, participants were told that the study was designed to gain information about magazine attractiveness. Specifically, they were told: "A local publisher has contracted our group to determine what characteristics people like and do not like about their publication. Specifically, they would like to know whether the success of their magazine's graphical layout is responsible for its overall success. You will receive a copy of the magazine and will be asked to rate each page on whether the material on the page is sufficiently interesting that you would look at it while leafing through the magazine."

Participants rated each page of the maga-

zine on attractiveness. Before beginning their ratings, the task was demonstrated to participants by applying the rating instructions to the first page of the magazine (front cover). Participants were given 30 seconds to rate each 2-page spread. The attractiveness ratings used a 9-point Likert-type scale numerically and verbally anchored at the two ends as follows: 1 = not at all attractive and 9 = extremely attractive. Participants marked their ratings on a response sheet, and were instructed to turn the page when a tone sounded. The tones were delivered by a tape player. These ratings were not analyzed. This procedure was intended to facilitate a belief that the research was only concerned with magazine attractiveness.

After all ratings were completed, participants were given a previously unannounced test on the benefits and risks of the prescription drug advertisements in the magazine. The test was composed of six pages (randomized for each participant) with a reduced version of each drug advertisement on top to serve as a cue to which drug was being assessed on each page. The reduced advertisement only contained the name of the drug and the accompanying picture contained in the advertisement. The test requested that participants give the main benefit and the three risks associated with the drug product, and to be as detailed and complete as possible. Participants had an unlimited amount of time to complete the test.

After the knowledge test was completed, each participant was presented all six versions of one of the six drug advertisements (presented in orders based on a balanced Latin square). They were instructed to rank order them according to how well they conveyed the uses and risks of the drug. The best version was assigned a rank of one, the worst version a rank of six, and the other four versions were assigned intervening ranks.

RESULTS

Benefit Knowledge

All participants completed the tests. Two independent judges graded the knowledge/

comprehension tests. The judges used a lenient criterion based on correct responses being identical or synonymous with the benefit and risk information in the advertisements. The reliability of the scoring (agreements/total \times 100) was 98.8%. Mean benefit, risk, and total knowledge/comprehension scores and preference ranks are shown in Table 3.

An analysis of variance (ANOVA) on benefit knowledge showed a significant effect of conditions, $F(5, 715) = 2.69, p < .05$. Paired comparisons using Tukey's Honestly Significant Difference (HSD) test showed that significantly more information was recalled in the separated/color and integrated/color conditions than the separated/no color and control conditions. Also, the integrated no color condition was significantly higher than the control condition. No other comparison was significant. A 2 (separated vs. integrated) \times 2 (color: absent vs. present) ANOVA using four of the six conditions (excluding the separated/enhanced and the control conditions) did not show significant effects.

Risk Knowledge

There were three risks associated with each drug. To develop a total risk score, the accuracy score for each of the three risks was combined into an overall risk knowledge score. An ANOVA on the risk knowledge test scores showed a significant effect of conditions, $F(5, 715) = 10.33, p < .0001$. Paired comparisons indicated that participants in the

separated/enhanced condition correctly answered significantly more risk information than the five other conditions. Paired comparisons using the Tukey HSD test showed that the control advertisements produced significantly lower knowledge scores than all of the other conditions except for the separated/no color condition. No other comparison was significant. A 2 (separated vs. integrated) \times 2 (color: absent vs. present) ANOVA failed to show significant effects.

Total (Benefit and Risk) Knowledge

Mean total knowledge scores were derived by totaling the one benefit score and three risk scores and dividing by four. An ANOVA on the total knowledge scores yielded a significant effect of conditions, $F(5, 715) = 8.38, p < .0001$. Paired comparisons using Tukey's HSD test showed that the enhanced condition produced significantly higher scores than all of the other conditions except the separated/color condition. The control condition produced significantly lower total knowledge scores than the other conditions, except the separated/no color condition. No other comparison was significant. A 2 (separated vs. integrated) \times 2 (color: absent vs. present) ANOVA showed a significant effect of color, $F(1, 143) = 4.68, p < .05$. When the risks were printed in color ($M = .25$) total knowledge scores were significantly higher than when color was absent ($M = .22$). No other effect in the ANOVA was significant.

TABLE 3
Mean Knowledge Scores for Benefit and Risk Information as a Function of DTC Prescription Drug Advertisement Condition

	Format Condition					
	Control (No Warning)	Separated No Color	Separated Color	Integrated No Color	Integrated Color	Separated Enhanced
Benefit	.50	.53	.67	.62	.64	.59
Risk	.04	.08	.13	.10	.11	.22
Total	.15	.20	.26	.23	.24	.31
Preference rank	5.81	3.69	2.03	4.61	3.00	1.85

Since this was primarily a repeated measures design experiment, there was a possibility of carryover effects across exposures to the six prescription drug advertisements in the magazine. This was partially controlled for by the use of a balanced Latin-square so that each of the format conditions appeared an equal number of times in each position in the magazine with no format condition consistently following another. Additional analyses were conducted to determine if the pattern of results using all of the advertisements (as in the analyses described above) was different from the pattern of results using only the scores of the first advertisement exposed to participants. The latter analysis employed a between-subjects design with knowledge acquisition scores from the first prescription drug advertisement that appeared in the magazine where different groups of participants saw different formats. Analysis of these data showed the same basic pattern of means as the full data set, suggesting that carryover effects did not substantially affect the knowledge acquisition scores.

Perceived Effectiveness Ranks

After the knowledge acquisition task was completed, participants were given all six formats of one of the drug advertisements and asked to rank the formats on the basis of how well they communicated the benefit and risk information. Ranks for each format condition are shown in Table 3. Low mean ranks indicate greater perceived effectiveness. A Friedman nonparametric repeated-measures ANOVA was used to test effects of conditions on ranks. The test revealed a significant effect, $X^2(5, n = 144) = 482.9, p < .0001$. The Wilcoxon signed-rank test was used to make pairwise comparisons among conditions. Since there was a large number of potential pairwise comparisons, a Bonferroni alpha correction was applied to maintain the overall experiment-wise error rate at .05. Thus, the comparisons used a conservative criterion for statistical significance. Comparisons showed that all conditions were significantly different from one

another except between the two lowest ranked (most preferred) conditions which did not differ (the separated/color and enhanced conditions).

A 2 (separated vs. integrated) \times 2 (color: absent vs. present) ANOVA on the perceived effectiveness ranks was significant for both main effects, $F(1, 43) = 153.2, p < .0001$, and $F(1, 143) = 305.5, p < .0001$, respectively. Separated ($M = 2.86$) risks/benefit produced lower (better) preference rank scores than the integrated ($M = 3.81, SD = .08$) versions. Color ($M = 4.15, SD = .08$) produced lower rank scores than no color ($M = 4.15, SD = .09$). There was no significant interaction.

Demographics

Additional analyses included demographic factors: gender, age, education level attained, and participant group (community volunteer vs. undergraduate). Each demographic variable was added as an additional independent variable into the ANOVA models already described. None of the analyses that included demographics showed an interaction with format condition. Also, there was no effect involving participant group. Only significant effects are described below.

Benefit Knowledge. In these analyses, there were three significant main effects of demographic variables. Table 4 contains the sample sizes by demographic grouping for the three main effects. Gender produced a significant main effect ($p < .05$). Females had significantly higher benefit knowledge scores ($M = .63, SD = .02$) than males ($M = .56, SD = .02$). To examine age, participants were divided into an older group (ages 41 and above) and a younger group (ages 18 to 40). Age produced a significant main effect ($p < .01$). The younger participants had significantly higher benefit knowledge scores ($M = .60, SD = .02$) compared to older participants ($M = .53, SD = .01$).

In the analysis of the highest level of education attained, the categories on the questionnaire were elementary school, middle

TABLE 4
Sample Sizes Based upon Main Effect Demographic Variables

Demographic Variable	n (sample size) per Grouping (%)
Gender	Males = 73 (50.69) Females = 71 (49.31)
Age	'Older' = 13 (9.03) 'Younger' = 131 (90.97)
Highest Education Level Attained	Some elementary school = 0 (0) Middle school/junior high = 1 (.69) Some high school = 0 (0) High school graduate = 54 (37.50) Technical/trade/community college = 11 (7.64) Some college = 68 (47.22) College graduate = 9 (6.25) Some graduate school = 1 (.69) Masters or advanced degree = 0 (0)

school/junior high, some high school, high school graduate, technical/trade/community college, some college, college graduate, some graduate school, and masters or other advanced degree. (None of the respondents reported having a graduate or advanced degree.) The ANOVA showed a significant main effect of attained education ($p < .01$). Participants whose highest education level included some college and above had significantly higher benefit knowledge scores ($M = .66$, $SD = .10$) than those attaining less education ($M = .17$, $SD = .20$).

Risk Knowledge. Only age showed a significant main effect ($p < .05$). Younger participants had significantly higher risk knowledge scores ($M = .16$, $SD = .01$) than the older participants ($M = .07$, $SD = .03$).

Total (Benefit and Risk) Knowledge. Only age and education attained produced significant main effects ($p < .05$). Older participants earned lower total knowledge scores ($M = .14$, $SD = .07$) than younger participants ($M = .25$, $SD = .06$). Table 5 contains means and standard deviations of total knowledge scores based upon highest level of education attained. Participants with some graduate school had significantly higher risk knowledge scores than all of the other groups. Also, participants who were high school graduates had significantly lower

scores compared to those who reported having taken some college courses.

Effectiveness Ranks. No effects involving demographics were seen using the rank scores.

DISCUSSION

The effects of formatting benefit and risk information in DTC prescription drug advertisements were examined. The results showed that the separated/enhanced condition was the most effective among the conditions investigated. It produced the highest total knowledge (benefit and risk information) and was best in the effectiveness ranks. While the separated/enhanced condition showed a slight reduction in the acquisition of the benefit material, this reduction was not significant. The format for this condition was based in part on the format proscribed by the ANSI Z535.4 (22) consumer product warning standard. The risks were contained in a box with a black and yellow striped border with a signal word panel on top that contained the alert icon (triangle enclosing an exclamation point) and signal word WARNING in a yellow background. Additionally, the text message in the enhanced condition was in larger bold print than the rest of the nonheadline text in the advertisements. The features composing this format have been

TABLE 5
Mean Total Knowledge Scores (Benefit + Risk Knowledge) as a Function
of Educational Level (SDs are in parentheses)

Total Knowledge Score	Highest Level of Education Attained					
	Middle/School/Junior High	High School Graduate	Technical/Trade Community College	Some College	College Graduate	Some Graduate School
Mean	.09	.15	.14	.19	.16	.42

found to enhance warning effectiveness (eg, 23,24).

The next best condition was the separated/color condition, but it was not significantly lower than the enhanced condition in benefit, risk, and total knowledge, nor did it differ in the effectiveness ranks. Thus, both the separated/enhanced and the separated/color advertisements had features that enhanced their salience within a context of other text and pictures. These two conditions involved the use of color in a separated format. Thus, conspicuity of the risk information appeared to be the main factor in producing higher knowledge acquisition and effectiveness ranks. These findings are consistent with a study by Young and Wogalter (17) showing that the salience of warnings in consumer product owner's manuals facilitates comprehension and memory. Conspicuous characteristics such as color, icons, and borders are more likely to capture attention, and as a result, draw attention to the highlighted information. Formats without conspicuous features decrease the chances that information will be seen or effectively processed.

The results suggest that color was a more important factor than the separated versus integrated manipulation. This was revealed in the (2 × 2) analyses that focused on these two factors. With the total knowledge measure, color produced a main effect, but the separated versus integrated factor did not. While both factors produced a main effect using the effectiveness rank scores, the effect was larger for the color than the separated/integrated factor.

While color was shown to be useful in

the context of a separated format, it was somewhat less useful in the context of the integrated format. The difference was not significant on knowledge acquisition but it was in the effectiveness ranks. These results suggest that more than one salience feature should be used to cue attention when possible. For example, a color cue might not be useful for color-blind individuals, who might benefit with additional (redundant) cues such as an icon or a border. Also, noncolor-blind individuals could benefit from redundant cues; if they do not see one cue, attention could be captured by other cues. These additional cues can readily be incorporated in a separated benefit/risk format, but to do so in the integrated format is not so easily accomplished.

While the results support theory predicting that separated benefit/risk information would be beneficial, predictions regarding the effectiveness of integrated formats were not confirmed. The reason for this is unclear. Information integration may not apply to the design of print media that communicate benefit and risk information, or processing information might be more complicated than theorized. For example, the utility of integration may depend on the users' task while being exposed to the material. Integration may be useful when individuals intentionally read through most or all of the material.

The effectiveness ranks seemed to closely parallel the knowledge scores. The concurrence of the preference/performance measures is consistent with theory concerning learning styles and schemas, that individuals prefer presentation formats that are consistent with

their learning styles (25,26). In addition, advertising research indicates that preferences reflect likability, which, in turn, positively influences recall (27). Thus, preference information may be a useful way to evaluate the salience of benefit/risk information in advertisements.

Other interesting findings were related to participant demographics. Younger adults produced higher knowledge scores than older participants. Also of interest is that older participants' risk knowledge was not significantly different from zero, indicating that, as a group, older participants did not gain in risk knowledge after exposure to DTC drug advertisements. The difference in recall between older and younger adults was consistent with prior memory research (28-31). Hess and Flannagan (32) found that in older adults, information that cannot be easily incorporated into an existing schema or knowledge base is more detrimental to recall in older adults than in younger adults. Morrow, Leirer, Andrassy, Tanke, and Stine-Morrow (33) found evidence supporting a link between the recall of drug information, design of instructions, and compatibility with preexisting schemas. The more compatible the instructions were with medication schemas, the more accurate the recall of instructions.

The present and earlier research suggests that it is important not only to consider general guidelines in the design of DTC advertisements, but also to consider accessible designs that compensate for age-related changes in information processing (eg, presbyopia requiring larger print). These findings support the importance of further research activity on age-related conspicuity features that can enhance knowledge transfer. Considering the higher use of prescription medications among the elderly, the need for research on this topic is vital.

Generally, benefit information was better recalled than risk information. This may be due to the fact that the basic purpose of the drug is to produce beneficial results. Also, other parts of the advertisements, and frequently the name of the drug, gave cues related to benefits. Furthermore, the difference

in recall of benefit and risk information may suggest a 'pollyanna effect' or a tendency to recall only positive information (34,35). Related to this tendency, research has identified a tendency of some patients to request medications from physicians solely on the basis of benefits (36). Therefore, in light of the results of this study, the aforementioned possible pollyanna effect, combined with interference due to joint presentation, as well as patients' motivations based upon benefit knowledge, design guidelines must be developed to counteract consumer processing styles in order to support more informed decision-making.

That females had significantly higher benefit knowledge scores compared to males is an unusual finding. Warnings research suggests that females may be more careful than males (37). This difference might also be an artifact of higher verbal abilities and thus, recall of verbal information among females (38). The results also showed that more educated individuals attained higher knowledge acquisition scores than less educated individuals. This result was expected. Educated individuals tend to absorb more information, and are likely to be better language processors.

Consumers are now forming impressions and making requests for specific prescription medications based upon DTC advertisements. Most advertisements, in general, are primarily designed and focused on marketing products by using principles of persuasion. They tend to be slanted toward emphasizing the benefits, usually to the exclusion of any risks. If the desire is to deliver balanced drug information so that consumers are better informed, user-centered design approaches that measure knowledge acquired are probably necessary (39). These approaches often involve several stages of iterative design and testing, and are currently being used in designing usable hardware and software computer interfaces.

In this research, an incidental exposure method was used in the knowledge acquisition procedures. Participants were not directly cued about the study's actual purpose

until after they had been exposed to the magazine and tested. As a measure of advertising effectiveness, incidental knowledge acquisition can be considered a reasonably realistic indicator of exposure in the 'real world' (40,41).

Given the fact that drugs can sometimes produce serious health complications, injury, and possibly death, finding better ways to communicate benefit and risks is desirable and should be pursued in future research. Principles of persuasion, information presentation, and decision-making should be applied to the design of DTC drug advertisements in order to produce more effective and user-centered communications. In addition, it is important to empirically validate relationships between specific consumer characteristics (eg, age, processing tendencies, etc.) and medication advertisement effectiveness.

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