LIST VS. PARAGRAPH FORMATS ON TIME TO COMPARE NUTRITION LABELS

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How textual information is presented may affect how easily information can be extracted. Formatting might benefit the search for particular types of information. The present study examined times to compare differently formatted food nutrition labels. Labels were either in one of two list-type formats with or without horizontal lines ("rules") or in a paragraph-type format. The results indicate that both types of list format produced significantly faster comparison times than paragraph format. The two list formats did not significantly differ. Also, participants who were non-native English users and who were not students were significantly slower than native English users particularly for the paragraph format label. Implications for list format over paragraph, and formatting, in general, are discussed.

Introduction

How information is presented may affect how well information can be extracted. Most of the textual information is in continuous prose with full sentences comprising parts of paragraphs. A much smaller percentage of text is presented in a list-type format with numbers or bullet points to denote different component information. Most of the relatively limited amount of research comparing the usability of these two types of text formatting has shown that list-type format is beneficial in reducing search or comparison times (e.g. Galitz, 1989, Goldberg *et al*, 1999, Wogalter and Post, 1989, Wogalter and Shaver, 2001). One reason for the benefit of list format over paragraph format in information search tasks is that the former has a lower print density than the latter. Greater print density has more characters in a given area and requires more search time than lower print density (e.g. Galitz, 1989, Tullis, 1983).

While there is research suggesting that list format can be beneficial to users viewing product manuals (e.g. Wogalter and Shaver, 2001), the issue whether it is better than paragraph format in food labels has not been addressed. Users' ability to search for important information on nutrition components (e.g. amount of fat and sodium) might be aided when information is presented in a list-type format as opposed to a paragraph-type format.

It is important to consider the disadvantaged populations when designing a food label. For example, when people get older, their eyesight and other senses decline (e.g. Coren *et al*, 1999). These deficiencies can make it difficult for older adults to read printed material. Also, older adults tend to have increasing comprehension and memory difficulties (e.g. Morrow and Leirer, 1999). Food product nutrition labels need to be designed so that they facilitate readability and understandability of the information on them. Research shows that list format facilitates older and younger adults reading of labels (e.g. Hartley, 1999, Morrow and Leirer, 1999). Instead of decreasing the print size to allow list format use, other label designs like tags increase the available surface space (e.g. Wogalter *et al*, 1993, Wogalter and Young, 1994).

The present research examined times to compare differently formatted nutrition labels for food products. Labels were either in one of two list-type formats or in a paragraph type format. In the U.S., the Food and Drug Administration (FDA) requires that the "Nutrition Facts" label be present on all packaged food products produced after 1994 (e.g. FDA, 2001). The law specifies a list-type format, but allows a paragraph version (linear "string" format) on food products with 101.6 square centimeters or less total surface area available for labeling. The list- type format presents the dietary component names on the left side column and the corresponding numerical information on the right side column. In the present study, there were two versions of the list-type label. One simulated the actual FDA label that has thick and thin rules ("horizontal lines") separating sections of the label. The other list format was otherwise identical but lacked the rules.

This experiment sought to determine whether the paragraph format hindered performance compared to list format. The participants' task simulated how these labels might be used in the real world, that is, in comparing two labels with regards to health benefits to the individual. Also, basic demographic data (e.g. age, gender, occupation, etc.) was collected to determine if they affected comparison times and if they interacted with label format.

Methods

Participants.

Thirty-six participants (M = 30.5, SD = 14.5) from the Raleigh, North Carolina area participated. The sample was composed of 22 males and 14 females. Half of the participants were college students and the other half were non-students from the surrounding area. The former received experimental credit for an introductory psychology course for participating, while the latter received remuneration of five dollars.

Apparatus

Each participant received three booklets containing 15 pairs of food labels positioned side-by-side. Figure 1 provides examples of each of the three types of food labels (list with rules as per style required by the FDA, list with no rules, and paragraph). Each of the list format labels used an abbreviated label format (e.g. Goldberg *et al*, 1999).

Procedure

All participants were given three booklets; each with one of three format conditions (list with horizontal lines, list with no lines, and paragraph). Each booklet contained 15 pairs of food labels positioned side-by-side. All three booklets had the same information content in the labels such that there was a label pair with identical information content in each format condition. Within each pair of labels, only one number of one of the labels was different for one of the nutrient conditions. Order of the booklets was counterbalanced across participants using a Latin-square of six orders. The font and size of print were identical in all conditions.

All participants were initially asked to assume that their physician had told them that they should eat foods with greater amounts of Calcium, Iron, and Vitamin C and to reduce intake of foods with Fat, Sodium, and Cholesterol. These components were manipulated in the labels, such that one of the two labels of each pair was more in compliance with these instructions. For each pair, one number was slightly higher or lower for one of the relevant nutrients. The participants' task was to determine which of the two labels on a page indicates a healthier food based on the above-mentioned dietary/health recommendations of their physician. Participants were told to evaluate the pair of labels on each page and to mark their answers on a response sheet. A timer was started when the participants began the first page of their booklet and was stopped when the participant gave a response for the last pair in the booklet.

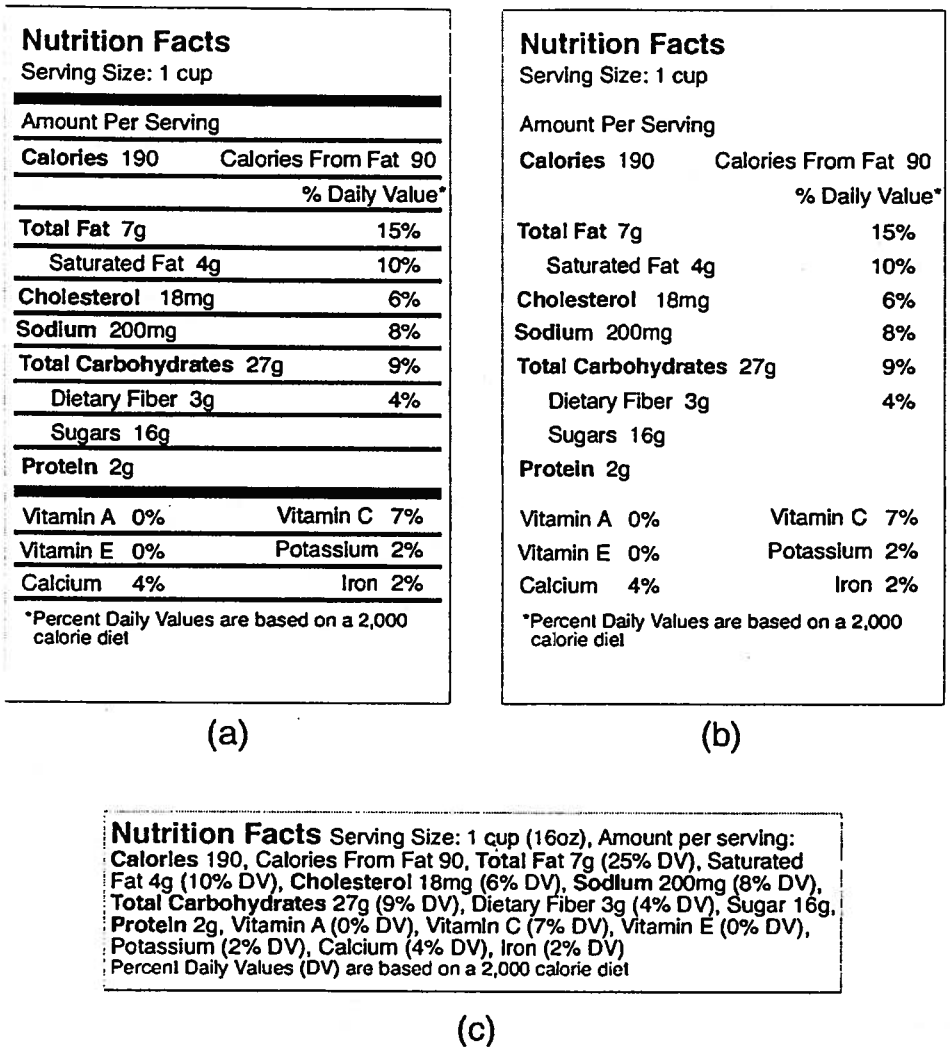

Figure 1. (a) List with horizontal lines ("rules"), (b) list with no rules, and (c) paragraph

Results

Using a repeated measure analysis of variance (ANOVA), the results indicated an overall effect of label format, $F(2,70) = 30.7$, $p<.0001$. Comparisons among the means, using Tukey's Honestly Significant Difference (HSD) test, showed that the list-type labels with the rules (M = 182.2 seconds, SD = 63.4) and without (M = 195.4 seconds, SD = 62.9) produced significantly faster comparison times than the paragraph-type label (M = 291.4 seconds, SD = 110.0). The list label with the rules produced somewhat faster comparisons than the list label without the rules, but the difference was not significant.

In addition, a set of analyses was conducted including several demographic variables to determine if they produced a main effect or interaction with label format. The demographic variables included age, gender, participant's first language (English vs. non-English), and occupation (student vs. non-student). Thus, a set of 2 (demographic variable) x 3 (label format) mixed-model analyses of variance (ANOVAs) with the former a between-subjects factor and the latter within-subjects factor were conducted. The only significant effects in the analyses were produced by the variables of first language and occupation.

There was a significant main effect of participants first language, $F(1,34) = 4.5$, $p<.05$, as well as a significant interaction with label format, $F(2,68) = 7.1$, $p<.01$. Non-native English users ($M = 275.9$) were significantly slower than native English users ($M = 214.7$). Table 1 shows the interaction means. The non-native English users were much more impaired by the paragraph format relative to the two list formats than the native English users.

Table 1. Mean search times as a function of first language and label format

	Nutrition label format (seconds)		
Language	List with rules	List without rules	Paragraph
English	162.9	170.2	233.4
Non-English	202.6	220.6	349.4

There was a significant main effect of occupation, $F(1,34) = 15.1$, $p<.001$, as well as a significant interaction with label format, $F(2,68) = 4.0$, $p<.05$. Non-students ($M = 257.5$) were significantly slower than students ($M = 188.9$). Table 1 shows the interaction means. The non-students were much more impaired by the paragraph format relative to the two list formats than the students.

Table 2. Mean search times as a function of occupation and label format

	Nutrition label format (seconds)		
Occupation	List with rules	List without rules	Paragraph
Student	179.3	194.0	270.7
Non-student	204.4	203.8	419.6

Discussion

The results confirm that list-type format facilitates the ease with which comparison times are made between nutrition labels. The data shows that paragraph format is much more difficult than the list format to make the same comparisons probably because it take more time to locate comparable parts in former than in the latter format. In the paragraph format the component parts are not linearly aligned in column as in the list format. The lack of a difference between the two list formats is probably due to the relatively small physical difference in the appearance of the two conditions.

The results also demonstrate that the paragraph format is particularly disadvantageous for certain populations of users. Although search time performance was generally lower for non-students and non-native English language users, these groups performed much more poorly with the paragraph format relative to the list formats. In fact, non-native English users took more than twice as long to make comparisons with the paragraph labels compared to both sets of list labels. A similar, but not as extreme, trend was found for non-students. One possible reason the student/non-student search time differences relates to age. The non-students ($M = 41.3$, $SD = 13.6$) were older than the students ($M = 19.7$, $SD = 1.5$). Possibly some of the non-students were experiencing age-related declines (e.g. difficulty in reading printed material).

The FDA currently allows a paragraph-format in nutrition labels when surface area for labeling is limited. However, the performance reduction with the paragraph-format labels in the present study was so dramatic that it strongly suggests that the FDA should reconsider allowing its use in favor of more usual list-type label. While the list label takes more space than a paragraph label (holding type size constant), sometimes labels can be re-arranged to provide more space. Additionally, the lack of space can sometimes be remedied by the use of alternative label designs (e.g., the addition of tag or wrap-around labels) to avoid a reduction of print size (e.g. Young and Wogalter, 1993). A question that remains is whether list format is better than paragraph when print size is reduced and/or surface area is held constant (e.g. reducing print size and line spacing in the list format version to match the footprint of the paragraph format version).

The current research has implications for other kinds of applications involving text format. Given the present results and earlier studies (e.g. Galitz, 1989, Goldberg *et al*, 1999, Wogalter and Post, 1989, Wogalter and Shaver, 2001), list formatted text appears to aid information acquisition performance across numerous kinds of information display domains compared to traditional paragraph presentation.

References

Coren, S., Ward, L.M. and Enns, J.T. 1999, Perceptual change in adults. In *Sensation and Perception*, Fifth Edition, (Harcourt College Publishers, Fort Worth)

Food and Drug Administration (FDA). April 2001, *Nutrition labeling of food,* 21 CFR 101.9, (U.S. Government Printing Office, Washington, DC)

Galitz, W.O. 1989, *Handbook of Screen Format Design,* Third Edition, (QED Information Sciences, Inc., MA)

Goldberg, J.H., Probart, C.K. and Zak, R.E. 1999, Visual search of food nutrition labels: *Human Factors, 41,* 425-437

Hartley, J. 1999, *What does it say? Text design, Medical Information, and Older Readers,* (Lawrence Erlbaum Associates, Inc., NJ)

Morrow, D. and Leirer, V.O. 1999, *Designing medication instructions for older adults,* (Lawrence Erlbaum Associates, Inc., NJ)

Tullis, T.S. 1983. The formatting of alphanumeric displays: A review and analysis: *Human Factors, 25,* 657-682

Wogalter, M.S., Forbes, R.M. and Barlow, T. 1993, Alternative product label designs: Increasing the surface area and print size: In *Proceedings of Interface '93,* (The Human Factors and Ergonomics Society, CA)

Wogalter, M.S. and Post, M.P. 1989, Printed tutorial instructions: Effects of text format and screen pictographs on human-computer task performance: In *Proceedings of Interface '89,* (The Human Factors Society, CA)

Wogalter, M.S. and Shaver, E.F. 2001, Evaluation of list vs. paragraph text format on search time for warning symptoms in a product manual: In A.C. Bittner Jr., P.C. Champney, and S.J. Morrissey (ed.) *Advances in Occupational Ergonomics and Safety IV* (IOS Press, Amsterdam), 434-438

Wogalter, M.S. and Young, S.L. 1994, The effect of alternative product-label design on warning compliance: *Applied Ergonomics, 25,* 53-57

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