

Formatting Food Labels for Safety and Health: Finding the Ingredients Faster

John Grishin
Will Walkington
Michael S. Wogalter

*Psychology Department
North Carolina State University
Raleigh, North Carolina 27695-7650 USA*

Being able to locate the list of ingredients on a food product label can be important for consumers' health and safety. However, the arrangements of components on food labels could make it difficult to find the ingredients. This study examines whether the relative physical placement of the list of ingredients affects the time it takes for users to locate it. The location of the list of ingredients was varied on a food product label. The results suggest that the list of ingredients is found faster when it is located in the upper portions of a food label and closer to the nutrition facts panel than other locations on the label. Implications for improving food label safety are discussed.

INTRODUCTION

Consumers' ability to determine the ingredients in food products can be crucial for health and safety (e.g., due to allergies, drug interactions, dietary restrictions). Making it quick and easy to locate ingredients can be beneficial not only in helping consumers make appropriate choices, but also in safeguarding against the consumption of harmful, even life-threatening ingredients. Figure 1 shows an example ingredient list from a food product label.

U.S. regulations leave considerable latitude for the location of the ingredient list on food labels (U.S. Code of Federal Regulations, 2015), and some label placements could make the ingredients difficult to find.

One way to determine whether a label section is easy or difficult to find is to measure how long it takes for the user to locate it. Shorter search times indicate better placement. The present research examined whether the location of the ingredient list affects the speed with which participants located it.

Prior research suggests that standardized placement helps people locate information. For example, standardizing the placement of component information in nutrition facts panels helps people make healthy choices based on stated nutritional values (Wogalter & Kalsher, 1994; Wogalter, Shaver, & Chan, 2002). However, because food labels often have complicated layouts with numerous component sections (e.g., graphics, cooking suggestions, recipes, marketing information, etc.), it would probably be unfeasible to mandate a rigid, consistent placement of the ingredient list on food labels without permitting numerous exceptions.

In the U.S., the nutrition facts label has been required on food labels since 1990 (NLEA, 1990). Figure 2 shows an example nutrition facts label. These labels have a relatively consistent format (although exceptions are allowed) and usually take up a substantial portion of the entire food label. Its large size and distinctive appearance makes it an easily

locatable landmark relative to other parts of the label (e.g., ingredients, cooking instructions, etc.). In other words, the nutrition facts label could possibly serve as a conspicuous landmark to cue the location of the ingredient list. An ingredient list placed adjacent to the nutrition facts label might therefore be easier to find than an ingredient list placed at other locations.

Two hypotheses concerning ingredient list placement were examined. One is based on reading order. Prior research indicates that people use scanning patterns that correspond to the language they use. For example, English-language users read from left to right and from top to bottom. And they tend to scan other informational displays in similar directions (e.g., Bzostek & Wogalter, 1999). This suggests that an ingredient list located near the top would be found faster than if it were located at other locations, particularly the bottom. Thus, the reading order hypothesis predicts that participants would locate an ingredient list faster if it were placed at the top of a label, rather than other locations.

Additional support for the reading order hypothesis has been found in research showing that warnings on a complex medication labels are found faster when they are placed closer to the top and left relative to the bottom and right (Bzostek & Wogalter, 1999; see also Lim & Wogalter, 2000). Thus again, the reading order hypothesis predicts the fastest search times when the ingredient list is placed at the upper portions of the label than near the bottom.

A different pattern of search time outcomes is predicted by the notion of landmark adjacency. If the relatively conspicuous nutrition facts panel functions as a landmark on a food label, then it could serve as anchor for nearby placement of the ingredient list. Landmark adjacency hypothesis predicts that faster search times would be produced by placing the ingredient list adjacent to the nutrition facts panel compared with more distant placements from this landmark.

This preliminary research sought to determine whether there would be search time differences due to placement of the ingredient list on a food product label.

INGREDIENTS: SUGAR, INVERT SUGAR, CORN SYRUP, MODIFIED CORN STARCH, CITRIC ACID, TARTARIC ACID, NATURAL AND ARTIFICIAL FLAVOR, TITANIUM DIOXIDE, RED 40, YELLOW 5 AND BLUE 1.

Figure 1. An example ingredient list.

Nutrition Facts	
Serving Size 1 cup (228g)	
Servings Per Container 2	
Amount Per Serving	
Calories 250	Calories from Fat 110
% Daily Value*	
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%
* Percent Daily Values are based on a 2000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.	

Figure 2. An example nutrition facts label.

METHOD

Participants

Forty-eight students from introductory psychology classes at a large southeastern U.S. university participated. Half of the sample was female.

Materials

Four two-dimensional (2-D) layouts of a cough drop package were created based on an existing package design. The location of the ingredient list was manipulated on each of the four layouts. Moving the ingredient list necessitated displacing some of the other layout components. In all cases, displaced components were kept as closely as possible to their original locations. The layout (placement) conditions are summarized in Table 1. In the Adjacent condition, the ingredient list was placed immediately next to the nutrition facts label, on the right. In the Top condition, the ingredient list was placed near the top of the layout. In the Above Right condition, the ingredient list was located above and to the right of the nutrition facts label. In the Bottom condition, the ingredient list was located at the bottom of the layout. These layouts reflect reasonable, ecologically valid placements of label components.

Table 1
Four Conditions of Ingredient list Placement

Layout	Relative Position of Ingredient list
Adjacent	Immediately to the right of nutrition facts label
Top	Top of layout
Above Right	Above and to right of the nutrition facts label
Bottom	Bottom of layout

Figures 3 shows the labels representing the four conditions. A red circle surrounds the ingredient list.

Procedure

After each participant read and signed a consent form, the experimenter explained to the participant that he/she would be shown several different package-label layouts for a food product. The four different layouts were concealed inside manila folders and were placed, one at a time, on the desk in front of the seated participant. Before each presentation, the experimenter stated, "Ready, set, go." On "go," the participant was to open the folder and search for the ingredient list. Also on "go" the experimenter started a timer to measure search/find time. Participants indicated that they had found the ingredients by placing their index finger on the ingredient list and stating aloud that they had found it (e.g., "Found it"). When the participant had signaled with both indicators, the timer was stopped and the time recorded. This measure of elapsed time to find the ingredients was repeated for each layout condition. Experimental sessions involved individual participants.

To examine whether order of presentation could play a role in the search for the ingredient list, half of the participants received the Adjacent layout first, followed by the remaining three layouts in random order. The other half received the layouts in different random orders. Several subsequent analyses showed no significant effect of presentation order.

Additionally, to examine the potential effect of induced urgency on search times, half of the participants were asked to read a short, printed paragraph that informed them that an ingredient, *Glycyrrhiza glabra*, commonly found in cough drops could have adverse pharmacological effects and could interact with certain medical conditions and medications. In fact, *Glycyrrhiza glabra*, did not appear in any of the four layouts that participants were subsequently shown. The above-mentioned paragraph was not presented to the remaining half of the participants. Subsequent analysis showed no effect of the presentation of the paragraph, and it is not discussed further in this article.



3b - Top



3d - Bottom

The mean time that participants took to find the ingredients is shown in Table 2 for each layout.

A one-way analysis of variance was used to analyze the data. The time data as a function of layout conditions was significant, $F(3, 188) = 3.80, p = .01, \eta = .06$. Layout condition accounted for 6% of the variability in the times.

The mean time that participants took to find the ingredients is shown in Table 2 for each layout.

Table 2

Mean search time (and standard deviations) to find the ingredient list of a food label in four conditions

Layout	Mean	S.D.
Adjacent	2.91	1.28
Top	3.54	1.77
Above Right	3.09	1.04
Bottom	3.80	1.59

Post hoc comparisons between means of the layout conditions using Fisher's Least Significant Difference test revealed that participants were significantly faster in finding the ingredient list in the Adjacent ($M = 2.91$) layout condition than in the Top ($M = 3.54$, $p = .03$) and Bottom ($M = 3.80$, $p = .003$) layout conditions. Participants also found the ingredients significantly faster in the Above Right ($M = 3.09$) condition than in the Bottom condition ($p = .02$).

DISCUSSION

The results indicate that the placement of the ingredient list on the food label affects the time that it takes to find the ingredient list. Participants found the ingredient list significantly faster when it was placed adjacent to the nutrition facts label than when it was placed on the top or bottom of the label. The results also showed that the Above Right condition produced significantly faster search times on the bottom.

Two hypotheses were examined: reading order and landmark adjacency. The findings did not conclusively support either of them. The reading order hypothesis predicted that placement at the top would be faster than the placement near the bottom. There was some support for this hypothesis. According to the reading order hypothesis, the fastest search time would be found for the Top condition yet the results showed that placement to have only the third fastest mean search time mean. However, the second fastest search times were found with the second highest physical placement of the ingredient list on the label, the Above Right condition. Additionally, the reading order hypothesis predicts that the slowest search times would be for the Bottom condition, and this result was found.

The second hypothesis, landmark-adjacency, predicted that placing the ingredient list next to a prominent landmark, in this case the nutrition facts label, would reduce search time compared to other placements farther from the landmark. This result was found with the exception that the mean search time for the Adjacent condition was not significantly faster than the Above Right condition. The Above Right condition was the second closest to the nutrition facts label and produced the second fastest search times. And notably, the search times for the Above Right condition were not significantly different from the condition with the fastest search times, the Adjacent condition.

Thus, these results provide some, but not complete, support for both the reading order and the landmark adjacency predictions. We know from these results that placing the ingredients at the bottom makes the list more difficult to find

as indicated by the slowest search times. Combined with faster times for higher label placements, the results provide some support for the reading order hypothesis. Support is not strong because the Top condition resulted in the third fastest search times. The fastest condition occurred when the ingredient list was placed adjacent to the nutrition facts label. This finding gives the best support for a benefit of being close to this major landmark section of the label. Further support comes from the Above Right condition, which produced the second fastest search times and having the second closest placement to the nutrition facts label.

Although these results do not conclusively support either of the initial hypotheses, it is probable that both play a role in influencing the time it takes to find the ingredients on a relatively complex food label. Subsequent research using a larger number of layouts that systematically position the ingredient lists in terms of adjacency and order would better serve to delineate their influence. Moreover future research could utilize a greater number and variety of food labels to examine its generalizability. Other factors might also influence search times. Future research could examine hypotheses beyond the two investigated here.

This research could have implications for health and safety of labeled food products. Faster search times can be critical for persons who have negative reactions to certain ingredients. Research on better label formatting could potentially help people find the ingredients list on food labels and assist them in making better choices for their health and safety. Future research might determine additional variables that may facilitate people's visual search for components on labels. Research could serve as a basis for potential revisions of food labels in future regulations and manufacturers' labeling decisions.

Additionally the principles pursued in this line of research could be useful when applied to other kinds of product labels and other complex displays. For example, it might provide guidance for household chemicals where ingredients could be positioned in different ways and with different anchor points.

REFERENCES

- Bzostek, J. A. & Wogalter, M. S. (1999). Measuring visual search time for a product warning label as a function of icon, color, column and vertical placement. *Proceedings of the Human Factors and Ergonomics Society 43rd Annual Meeting*, Santa Monica, CA: Human Factors and Ergonomics Society.
- Lim, R. A., & Wogalter, M. S. (2000). The position of static and on-off banners in WWW displays on subsequent recognition. *Proceedings of the International Ergonomics Association & the Human Factors and Ergonomics Society Congress*, 44 (1), 420-423.
- Nutrition Labeling and Education Act (1990). U. S. Public Law No. 101-535, 104 Stat 2353.
- University of Maryland Medical Center (2012). *Licorice*. Retrieved from <http://umm.edu/health/medical/altmed/herb/licorice>
- U.S. Code of Federal Regulations (2015). Title 21: Food & Drugs, Part 101, Subpart A, 101.2.b, Washington, DC: Government Printing Office. Retrieved from U.S. Government Printing Office: <http://www.ecfr.gov/cgi->

bin/retrieveECFR?gp=&SID=378948261bd4981f96cfc2a82505a840&r=SECTION&n=21y2.0.1.1.2.1.1.2

- Wogalter, M. S. & Kalsher, M. J. (1994). Product label list format: Effects of item arrangement and completeness on comparison time and accuracy. *Proceedings of the Human Factors and Ergonomics Society 38th Annual Meeting*, Santa Monica, CA: Human Factors and Ergonomics Society.
- Wogalter, M. S., Shaver, E. F., & Chan, L. S. (2002). List vs. paragraph formats on time to compare nutrition labels. *Contemporary Ergonomics 2002*, London: Taylor and Francis.