Brief report

Implications of Tobacco Industry Research on Packaging Colors for Designing Health Warning Labels

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Abstract

Introduction: Health warning labels (HWLs) are an important way to educate the public about the dangers of tobacco products. Tobacco companies conducted research to understand how pack colors affect consumers' perceptions of the products and make packages and their labeling more visually prominent.

Methods: We analyzed previously secret tobacco industry documents concerning the tobacco industry's internal research on how cigarette package colors and design influence the visual prominence of packages and consumers' perceptions of the harmfulness of the products.

Results: The companies found that black is visually prominent, placing dark pack elements on a contrasting light background makes them stand out more, and black text on a white background is more prominent than white text on a black background. Yellow most quickly and effectively seizes and holds consumers' attention and signals warning or danger, while white connotes health and safety. Using black text on a bright contrasting background color, particularly yellow, attracts consumers' attention to the message.

Conclusions: Tobacco industry research on pack color choices that make pack elements more prominent, attract and keep consumers' attention, and convey danger instead of health should guide governments in specifying requirements for HWLs. These factors suggest that HWLs printed on a yellow background with black lettering and borders would most effectively seize and keep consumers' attention and signal the danger of cigarettes and other tobacco products.

Implications: Tobacco companies' internal research on improving the prominence of pack elements suggests that HWLs using black lettering on a contrasting yellow background would most effectively seize and hold consumers' attention and signal the danger of cigarettes and other tobacco products.

Introduction

Strong health warning labels (HWLs) on tobacco products are a tool to address the global tobacco epidemic.¹ The effectiveness of health warnings depends on their size and design,^{2,3} and plain packaging may increase their effectiveness.⁴ The implementation

guidelines for the WHO Framework Convention of Tobacco Control recommend that, "Parties should select contrasting colours for the background of the text in order to enhance noticeability and maximize the legibility of text-based elements of health warnings and messages."⁵

Tobacco companies have long understood that pack colors influence how consumers perceive the products within these packages and have conducted marketing research since as early as the 1950s to analyze the nature, psychological effects, and impact of color on consumers' purchasing choices and to analyze how color could be used to design effective packaging.^{6,7} They use cigarette pack colors to manipulate consumers' brand choices and perceptions of harm⁸⁻¹⁴ and to change smokers' perceptions of the taste and strength of the cigarettes inside the pack without changing the cigarettes themselves.⁶ The companies conducted extensive research to better understand how changes to the pack colors could effectively create new tobacco products, just as changes to the cigarettes' ingredients, additives, or flavorings.⁶ In the course of their research, they tested whether some pack colors are more visually prominent than others, and whether some pack colors can better seize and hold consumers' attention than others. This research can inform design of effective HWLs.

Methods

Between January 2013 and September 2015, we analyzed previously secret tobacco company documents available at the UCSF Truth (formerly Legacy) Tobacco Industry Documents Library (<https://industrydocuments.library.ucsf.edu/tobacco/>) on the tobacco industry's internal research on how cigarette package colors influence the visual prominence of packages. We used standard snowball search techniques,¹⁵ beginning with the search terms "(color or colour) and pack*" (225,015 documents), "health warning labels" (2,283 documents), "(health warning labels) and (color or colour) and pack*" (780 documents), "(color or colour) and pack* and 'visual prominence'" (100 documents), "(color or colour) and pack* and attention" (57,578 documents), and "(color or colour) and pack* and 'seize attention'" (four documents). Additional documents were found by reviewing documents with adjacent Bates numbers. These searches identified documents detailing the companies' market research and scientific literature reviews concerning the use of color in package design to understand how to make cigarette packs and their elements more prominent. We reviewed approximately 150 industry documents; this paper is based on 20 of them.¹⁶⁻³⁵

Results

In the 1980s, the tobacco industry became concerned that they would be faced with increasing restrictions on advertising, which would make the cigarette pack itself more important since it would likely be "the last means of communicating with the consumer."^{16,17} To meet these challenges, research techniques were developed to ensure that the pack design would be used in the most effective way not only to convey brand imagery but also to create visual impact by achieving a high level of visual prominence.^{16,18-21} The companies used several techniques to help them understand the relationship between visual prominence and cognitive salience.

A conventional tachistoscope was used to measure the visual prominence of various elements within a cigarette pack by measuring in milliseconds the amount of time it takes for a person to identify particular pack elements. This technique could indicate, within any one pack, how the various color combinations work to make the design elements stand out.^{16,18-21} The projection tachistoscope was used to measure the standout of various cigarette pack designs in interaction with other packs at the point of sale, as well as to measure the impact of different types of pricing stickers, point of

sale add-on material, and the best positioning for the brand logo in posters.¹⁸

Eye gaze monitoring was used to track an individual's viewing behavior over a stimulus field (such as shelving displaying tobacco products at the point of sale) and was used to understand where a consumer directs his attention at the point of sale and how long the consumer visually inspects each discrete point of interest.¹⁸ To aid their pack design research, companies introduced high-resolution computer-aided graphics systems in 1985 to allow a large number of variants to be developed and tested.¹⁷

The companies' research showed that some colors (red and black) are more visible and prominent than others (gray), make information more memorable, and appear to advance and make one pack look larger and more visible than neighboring packs²² (Table 1). The companies learned from marketing research covering the use of specific colors to attract buyers that yellow is the first color that the consumer's eye sees and is processed the fastest, is the most likely color to get quick attention, is seen from a greater distance than any other color, and is retained in the memory longer.^{22-25,36} Yellow has the highest "retention value" of all colors, which means that "it hits you harder in the eye and you will remember it longer."³⁶ However, yellow does not make the customer want to buy the product because it is not perceived as pleasant²⁵ and has a low preference rating.³⁶ Although yellow is not well liked, it is easily recalled.³⁶ Yellow increases stress and anxiety,²⁴ and according to industry advisor Carlton Wagner, Director of the Wagner Institute for Color Research, yellow is found in nature in combination with black to notify or warn you of danger (eg, stinging bees are yellow and black).²³ Since black is visually dominant, it attracts and keeps consumers' attention to package elements.^{21,22,26} The combination of yellow and black add to the retention power of an image.³⁶ For example, although triangles are images that can be easily recalled, a triangle in black or white does not remain in the memory as long as a triangle in black on yellow or black on orange.³⁶

Although certain color pack elements (eg, red or black) tend to be prominent, the background on which these elements are placed plays an important role in determining the total effect. Tobacco company tests revealed that placing design elements against a white background, using high color saturation, and creating a good figure-ground contrast are all features that make package design elements visually

Table 1. Summary of Industry Research on How Packaging Color Impacts the Visual Effectiveness of Labeling

Impact	Color	Company	Year
Visual prominence	Black	RJR	2001 ²²
	Red	RJR	2001 ²²
		BAT	1986 ²⁰
Seizes attention		BAT	1980s ²¹
	Red	RJR	2001 ²²
	Yellow	RJR	2001 ²²
		PM	1995 ²⁵
		PM	1990 ²³
Contrast		PM	1990 ²⁴
	Red	BAT	1980s ²¹
	Black on white	RJR	2001 ²²
		BAT	1980s ²¹
Fast		BAT	1986 ²⁰
	Yellow	PM	1990 ²³
		PM	1990 ²⁴
		RJR	2001 ²²
Warns of danger	Yellow	PM	1990 ²³

prominent.^{20,21} Finding that contrast is the most important factor in determining visual standout, in 1986 BAT researchers concluded, “The rule is very simple, if the element has high colour contrast with its background it will stand out, if it does not then it will not.”²⁰ BAT’s study found that this effect may be accentuated when the dark background on which the object is placed forms part of the pack detail itself.²⁰

Of particular relevance to the design of effective warnings, industry research revealed that dark pack elements on a light background are more visually prominent than light elements on a dark background. BAT used tachistoscopic testing to compare the relative visual prominence of elements on the Muratti Ambassador Multifilter cigarette packs with those on Muratti Ambassador Extra packs. Although the brand name, font style, and color combinations on the two packs were the same, the brand name on the Multifilter pack was light and presented on a dark background, while the brand name on the Extra pack was dark and presented on a light background (Figure 1). The test subjects identified the Extra brand in 7.0ms, one-third faster than the 10.5ms it took to identify the Multifilter brand, confirming that a dark figure presented on a light background stands out more than a light figure on a dark background.²⁰ Likewise, RJR’s research on revised Camel Filters packs reached a similar conclusion: changing the pack from brown with white print to white with brown print resulted in reduced strength perceptions as well as better brand name recognition, and printing the UPC code over a brown background made it less noticeable.²⁷

The companies’ research into the emotional impact of colors^{25,28,29} also revealed that certain colors used on packaging create nonverbal

and unconscious impressions about the health dangers associated with smoking. A 1986 BAT research and development report on pack design found that “white is generally held to convey a clean, healthy association.”²⁰ Lighter colors on packs are associated with “light” and “mild” cigarettes, and tobacco companies scientifically adjust the amount of white space or the tone of a particular pack color in order to make consumers perceive that the cigarettes inside the packs are lighter or milder or have lower tar delivery.^{20,26,27,30} Since the enactment of the Family Smoking Prevention and Tobacco Control Act in the United States which prohibited the use of “light” and “mild” descriptors,³⁷ the companies have replaced those words with light colors that communicate “light” and “mild.”^{38,39}

Discussion

Tobacco company research demonstrating that specific color choices can make pack elements more prominent and seen more immediately, can attract and keep consumers’ attention, can convey danger, and can inform governments in designing required HWLs. Contrast is the most important factor in determining visual standout and dark text and elements on a light background are seen more quickly than light elements on a dark background. Black is visually dominant and attracts and keeps consumers’ attention to package elements,^{21,22,26} while yellow has the greatest visibility, is the first color seen by consumers, is processed the fastest, and universally signals warning or danger.^{22–25,36}

FIGURE 52

SAMPLE: 12 U.K. SUBJECTS

RECOGNITION TIME (MSEC) = 7.0, N = 11

N	MEAN (MSEC)	S.D. (MSEC)
11	7.0

FIGURE 50

SAMPLE: 12 U.K. SUBJECTS

RECOGNITION TIME (MSEC) = 10.5, N = 5

N	MEAN (MSEC)	S.D. (MSEC)
5	10.5	

Figure 1. BAT tachistoscopic test results on Muratti Ambassador cigarette packs showing that black text on a white background (top) stands out more and is recognized more quickly than white text on a black background (bottom).²⁰ This illustration is from a previously secret tobacco industry document, which is only available as a low quality image. The document is freely available at the UCSFTruthTobacco Documents Library.

The tobacco industry's research is consistent with health research showing that more visually prominent and salient warning labels are more effective.^{2,3} It is also consistent with industrial safety research on the influence of color on warning label perceptions that found that color enhances the saliency of warnings, increases the readability and level of communicated hazard, draws attention, and influences memory, and recommends that label designers should use background colors that maximize luminance and chromatic contrast with the warning text.⁴⁰ Studies conducted by social psychologists found that warning label effectiveness is enhanced by using bright colors like orange which attracts consumers' attention and prompts them to consider the message content and conveys feelings of danger or warning that increase the messages' impact.⁴¹

Both tobacco industry and independent research suggest that black letters on a highly visible, bright, and contrasting background (yellow or orange) would be most effective for presenting the text components of warning labels and would be more visibly prominent and effective than labels that use black lettering on a white background or white lettering on a black background. These findings also support the WHO Guidelines to FCTC Article 11⁵ which recommend using contrasting colors for the background of the text to enhance noticeability and maximize the legibility of text-based elements of health warnings and messages. However, FCTC does not provide any specific recommendations for which colors to use.

Our analysis did not identify any industry research specific to warning label design in the context of total package design either alone or in the context of total package design. Future research is needed to understand how consumer perceptions of HWLs may be altered depending on the extent that the warning label colors contrast with other elements of the pack.

The tobacco companies' research into the nonverbal impact of colors^{25,28,29} is also helpful in understanding how warning labels could be designed that create subconscious impressions of the health dangers associated with smoking. Even with labels that carefully adhere to legal restrictions governing words and images, the fast, nonverbal and unconscious response triggered by colors can break through to more powerfully communicate desired statements. All of these factors suggest that HWLs printed on a yellow or orange background with black lettering and borders would most effectively seize and keep consumers' attention and signal the danger of cigarettes and other tobacco products.

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Declaration of Interests

None declared.

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