The Effects Of A Raised Label Border On Warning Effectiveness Measures

Michael J. Kalsher
Michael B. Cote
Matthew V. Champagne
Department of Psychology
Rensselaer Polytechnic Institute
Troy, NY 12180-3590

Michael S. Wogalter
Department of Psychology
North Carolina State University
Raleigh, NC 27695-7801

ABSTRACT

Research has examined various factors that influence warning effectiveness. Virtually no research, however, has explored the possibility of improving warnings by incorporating hepatic (touch) cues. The present study assessed the impact of adding a raised border surrounding the warning message on a common consumer product (glue). The raised border warning was compared to the same warning without a raised border and a no-warning control in the context of actual product use (constructing a model airplane). Results indicated that the raised border significantly increased the noticeability, comprehension, and recall of the warning label compared to a no-warning control. There was a trend for compliance to be highest for the raised border condition, but it was not statistically significant. Implications for improving warning design are discussed.

INTRODUCTION

Numerous empirical studies have investigated the features, and combinations of features, that influence the effectiveness of warnings (e.g., Wogalter and Laughery, 1996). The features that enhance effectiveness include physical characteristics of the warning (e.g., color, font, signal words) and contents of the warning message itself (e.g., explicit consequences).

In some cases, instructional warnings and other types of safety information are mandated by Federal or State laws. However, these mandates do not guarantee that people will behave safely. In fact, the need for better warnings is apparent in light of the evaluations of the government warning presently required on all beverage alcohol containers sold in the U.S. A review of studies (MacKinnon, 1995) evaluating the impact of the government-mandated alcohol warning has shown that people report being aware of the warning, but it has not changed their attitudes or behavior with respect to the use of alcoholic beverages. Therefore, further research aimed at increasing the effectiveness of warnings is urgently needed.

Rasmussen (1986) and Lehto and Miller (1986) have proposed a theoretical model that takes as its basis the fact that people actively integrate and process information from multiple sensory inputs simultaneously. Their analysis suggests that when people perform a task or use an object, sensorimotor feedback from their various sensory receptors is integrated with previously incorporated schemas and scripts (i.e., knowledge and past experience). Applied to warnings, this model suggests that warning effectiveness could be enhanced by communicating hazard information via multiple sensory modalities.

Unfortunately, very little research has been conducted to assess the potential effectiveness of warnings that convey information to more than one sensory modality. Indeed, all (or virtually all) warning labels rely on the visual modality to communicate hazards. The few published studies that incorporate multiple modalities, however, do show promise. For example,

Wogalter, Kalsher and Racicot (1996) reported that compliance with a printed warning increased significantly when a redundant voice warning was present as compared to when it was absent. Similarly, Wogalter and Young (1991) examined the effects of a print-only warning, a voice warning issued by the experimenter, or both, on behavioral compliance (i.e., wearing a mask and gloves while mixing disguised chemicals). The results of their study showed significantly higher behavioral compliance when the warning was presented via both modalities compared to the print-only condition. This result was confirmed in a field study using a wet floor scenario in a shopping mall. Finally, Selcon, Taylor, and McKenna (1995) showed that multi-modal warnings, presented both auditorily and visually, decreased pilots' response times to an aircraft missile approach compared to response times when each warning type was presented separately.

In light of this encouraging evidence, it is surprising that very little research has examined the possibility of incorporating into visual warning systems sensory modalities other than auditory. Touch is one possibility since most consumer products (e.g., various containers) require that people handle these products during their use. Some earlier related research seems to support this view. For example, a number of studies have shown that interactive warnings, ones that require physical manipulation by the consumer prior to using a product, are more effective than conventional on-product labels (e.g., Dingus, Wreggit, & Hathaway, 1993; Duffy, Kalsher, & Wogalter, 1995; Gill et al., 1987; Hunn & Dingus, 1992). Thus, the purpose of this study was to examine whether the addition of touch cues can enhance the effectiveness of instructional warnings on a common consumer product.

METHOD

Participants

Fifty-one undergraduate students (28 females; 23 males) from Rensselaer Polytechnic Institute participated in the study. Participants were randomly assigned, in equal proportions (17 per condition), to the no-warning control, the regular warning, and the raised border condition (the regular warning surrounded by a raised border).

Materials

The original manufacturers labels on one-ounce containers of model glue were removed and replaced with labels based on those reported by Wogalter and Young (1994). For safety purposes, the original contents were removed and replaced with rubber cement. A black-and-white reproduction of the label is depicted in Figure 1. Text was printed in black and the background color was bright saturated yellow. In the no-warning condition, the warning information was omitted and the product information and directions were printed in black type using an 8-point Geneva (san serif) font. The text on the regular warning and the raised border warning was printed in black type, using a 6-point Geneva font.

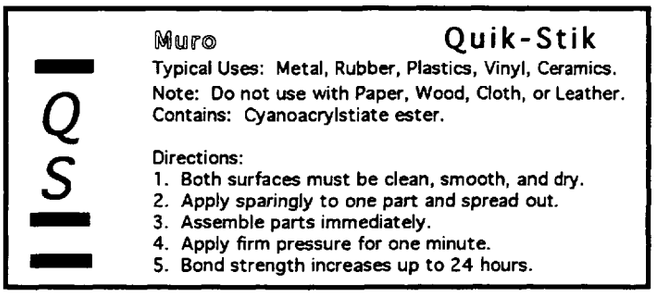
In the raised border condition, a border (black in color) was constructed from layers of paper cardboard (approximately .20 cm in thickness) that were attached to the surface of the warning with a common adhesive. The border was approximately .48 cm in width. All other aspects of the labels were identical across the three conditions.

A model airplane kit, which required the use of glue during assembly, was placed on a small table in the experimental room (approximately 2.4 x 3.7 m). Materials related to model construction, including brushes, a decal knife, scissors, and newspaper, were also placed on the table. Personal protective equipment (PPE), including latex gloves, protective goggles and masks, and lab coats were placed in an open adjacent cabinet.

Procedure

After providing informed consent, each participant was taken to the experimental room and asked to be seated at the table. They were told that the purpose of the study was to determine how well people can continue a task that has already been started by another person. The experimenter informed them that a number

Control Label



Raised Border/Regular Label

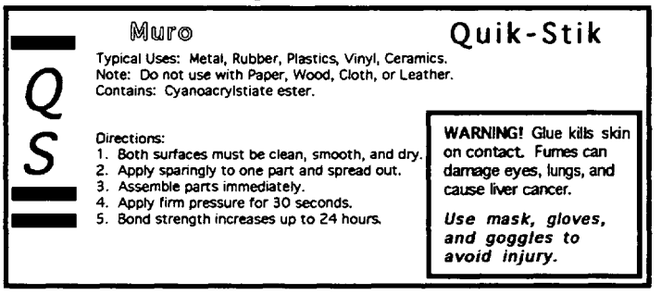


Figure 1. Black-and-white reproductions of the Control label (top) and the Raised Border and Regular Labels (bottom).

of different tasks were being used and that they should not be concerned if the task assigned to them was something they did not usually do. Unbeknownst to them, all participants in the experiment performed the same task: assembling a model airplane that was already partially completed. Participants were asked to familiarize themselves with the materials in the room and the instructions, and then to proceed with the task when they were ready. The experimenter then left the room.

After 15 min, the experimenter re-entered the room and asked the participant to stop working on the model. At this point, the experimenter observed whether the participant had used any or all of the available safety equipment. Participants were then asked to complete a brief questionnaire. The first three items on the questionniare asked them whether they had noticed and read the warning label and to recall its contents (*effectiveness measures*). Four additional items assessed participants' risk perception regarding: (1) the hazardousness of the product (glue) and the task (using glue to assemble the model); and (2) the likelihood of being injured by the product or while performing the task (*risk perception measures*). Responses to the risk perception measures were assessed on 9-point Likert-type scales (1 = not hazardous/ likely, 9=extremely hazardous/likely). Finally, participants were asked whether they had prior experience using glue or building models (*measures of prior experience*).

After they had completed the questionnaire, participants were shown all three label designs and asked to select the design they felt (a) best conveyed information to consumers and (b) had the greatest consumer appeal. Following the preference measure participants were debriefed and thanked.

RESULTS

Effectiveness Measures

The effectiveness measures were scored as dichotomous variables. Separate chi-square analyses were performed for each of the four variables, with the following results.

Noticeability. The chi-square for noticeability was significant, $X^2(2)=21.26$, $p<.05$. Nine of 17 participants noticed the warning in the regular warning condition, whereas 13 of 17 noticed the warning in the raised border condition. Not surprisingly, none of the 17 participants in the no warning condition noticed the warning.

Read. The chi-square concerning whether or not participants read the warning was significant, $X^2(2)=14.17, p<.05$. Five participants of 17 in the regular warning condition read the warning, whereas ten participants of 17 in the raised border condition reading the warning. None of the participants in the no warning condition reported reading the label.

Recall. Scoring recall of the warning label was based upon the use of a lenient criterion. Responses were counted as correct if the basic concepts (that breathing vapors or contact with skin was hazardous) were present. Inter-judge reliability was 91% and was computed according to following formula: number of agreements divided by the number of agreements plus disagreements multiplied by 100. The chi-square performed to detect differences in how well participants could recall what the warning said was significant, $X^2(2)=12.01$, $p<.05$. Five participants of 17 in the regular warning condition successfully recalled what the warning label said, whereas nine of 17 participants in the raised border condition successfully recalled the contents of the warning label. None of the participants in the no warning condition reported recalling what the warning said.

Behavioral Compliance. The chi-square performed to detect differences in behavioral compliance did not reveal any significant differences between conditions, $X^2(2)=1.77$, $p>.05$. However, there was a trend of higher compliance among participants exposed to the raised border similar to that shown for other measures of effectiveness. Only five of 51 subjects (9.8%) complied with the warning, one in the No-Warning condition, one in the Regular Warning condition, and three in the Raised Border condition.

Risk Perception Measures

Separate one-way ANOVAs were performed on each of the four risk perception measures; two that assessed the participants' perception of hazard associated with the product (glue) and the task (using the glue to assemble the model), and two that assessed the likelihood of sustaining an injury from the product or task. No significant effects were found ($ps>.05$). The mean ratings on these measures, across all conditions, were quite low: a strong indication that participants did not perceive the product or task as being hazardous.

Measures of Prior Experience

Seventy-eight percent of the participants indicated that they had prior experience using glues they knew could be potentially hazardous to their health. Sixty-one percent of the participants had assembled a model prior to the experiment.

Preference Measures

Of the 51 participants, 48 (94%) indicated that, in their opinion, the raised border label was the most effective at conveying warning information. In terms of consumer appeal, participants showed a preference for the raised border variant (55%) compared to the Regular Warning (27%) and the No-Warning control (18%).

DISCUSSION

Compared to the no-warning control label, the raised border used in this study significantly increased participants' reports of noticing and reading the warning and memory of its contents. Preference measures supported this pattern in that a clear majority of participants ranked the raised border highest in terms of its capacity to convey warning information to consumers.

Unfortunately, the use of the raised border did not show a statistically significant increase in behavioral compliance, measured by participants' use of personal protective equipment (i.e., gloves, mask, lab coat) as directed by the warning. The dichotomous

compliance measure is less sensitive than continuous ratings and preference rankings. It is noteworthy, however, that the expected trend was shown with more persons complying in the raised border condition.

There are two likely explanations for the low compliance rates observed. The first involves the product, ordinary model glue. Most of the participants (i.e., 78%) indicated they had used this product in the past. In addition, participants' ratings on several risk perception measures revealed that participants, across all three conditions, perceived very little threat from either the product (glue) or the task. Thus, familiarity may explain, at least partly, why compliance was quite low in this experiment.

Second, it is possible that the warning itself may have played a role in the low compliance rates observed. The warning used in this study did not provide behaviorally specific instructions; in other words, it did not specifically state that participants should use the particular personal protective equipment provided. Research has shown that explicit warnings are more effective (e.g., Laughery et al., 1995). In some respects, though, the warning used in this study is "realistic" in that warnings are frequently vague. Thus, participants in this study may have taken only the precautions they felt suitable, such as exercising care when using the product, rather than donning PPE. If so, this could be shown in measures of accuracy and time. Unfortunately we did not collect these data.

Despite the failure to elicit behavioral compliance, this study is important as it is the first time that a raised border has been empirically tested and reported in the warnings literature. While the raised border fell short of the goal of increasing compliance, other measures of effectiveness did provide evidence of its benefits. However, additional research is needed to determine the parameters of effective tactual warning cues in warning labels.

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