High Levels of Behavioral Compliance in a Realistic Product Assembly Task

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Abstract

This study examined the effects of message framing on behavioral compliance in the context of a believable lab-based scenario designed to disguise the true purpose of the research. Participants were led to believe that the study's purpose was to improve the instructions that accompany consumer products requiring full or partial assembly and that they would perform a carpentry task that involved the use of several types of manual and power tools (e.g., a circular saw). The assembly instructions provided to them either did or did *not* contain a framing message. When it was present, the message was either framed positively (gain-frame) or negatively (loss-frame), or it merely instructed them to use personal protective equipment (PPEs) as directed by the on-product warning. An important outcome was the relatively high level of behavioral compliance observed. The message framing manipulation was not successful, but slightly higher levels of compliance were observed among participants in the loss-frame condition. Unexpectedly, level of experience (operating the circular saw) was positively related to compliance. This finding contrasts with the usual familiarity effects reported in other warnings research. Implications of this study for future research are discussed.

Introduction

A large number of studies have investigated conditions that facilitate and inhibit warning effectiveness. The majority have been experimental studies that manipulate specific features of the warning and observe their impact on measures of cognitive processes presumed to precede behavioral compliance. This approach, referred to as the "information processing" model, suggests that in order for people to comply with a warning, they must first notice it, read it and comprehend its intended meaning, remember it, and finally, be sufficiently motivated to act on their intentions to comply with it (Wogalter & Laughery, 1996). The rationale for the use of this framework is two-fold.

First, it presupposes that a number of cognitive "steps" intervene between a person's initial contact with a stimulus event and their subsequent reaction to the event. This framework has formed the basis for a body of empirical research aimed at identifying the features, alone and in combination, that enhance warning effectiveness. Among the most robust features identified through this research are color, location, pictorials, and explicitness of the warning message. The most important predictor of warning effectiveness is probably perceived hazard (Wogalter, Brems, & Martin, 1989).

A second reason for a researcher's reliance on the information processing framework stems from practical concerns that arise when the focus of the research is on behavioral compliance. One challenge evident in laboratory-based compliance research is the need to create a realistic experimental context. Most studies of behavioral compliance are conducted on college campuses using students who participate to fulfill a course requirement. Because of ethical constraints by university review boards, researchers are not typically able to assess compliance to warnings in situations that actually place participants at risk for injury. Moreover, some students may not believe researchers will actually put them in a situation in which they could be injured. As a result, the number of realistic scenarios in which the research might assess compliance behavior have been limited, with the chemistry laboratory demonstration task being the most prevalent (e.g., Wogalter et al., 1989). Clearly, studies that move this field of research away from a reliance on perceptual measures and toward field research that measures compliance are needed. Therefore, one aim of this study was to build on previous research by Kalsher, Kellner, Johnson, Silver and Wogalter (1997). These researchers created a believable lab-based scenario and an experimental context that effectively disguised the true purpose of the research.

A second aim of the present study was to investigate a factor that has not yet been examined in the warnings literature: message framing. According to prospect theory, people are risk averse when potential gains are made salient, but risk seeking when potential losses are made salient (Detweiler, Bedell, Salovey, Pronin & Rothman, 1999). Applied to message framing, prospect theory suggests that people respond differentially to factually equivalent messages depending on how these messages are presented.

Message framing has recently been investigated in the context of designing health messages. Detweiler et al. (1999) compared the relative effectiveness of messages that either highlighted potential gains (gain-frame messages) or potential losses (loss-frame messages) in persuading beach-goers to obtain and use sunscreen. They used prospect theory to predict that *prevention* behaviors (using sunscreen) should be higher for individuals who receive gain-frame messages than loss-frame messages. Results showed that participants who read brochures containing the gain-frame messages about sunscreen use were more likely to request sunscreen, to give higher intentions to apply sunscreen while at the beach, and to give higher intentions to use sunscreen with a protection rating of 15 or higher than participants who read brochures containing loss-frame messages.

These results highlight the potential beneficial uses of message framing, but additional research is needed to determine: (1) whether message framing is relevant to warnings; and (2) which approach to framing—gain-framing or loss-framing—would best facilitate compliance.

Method

Participants

Participants were 60 male (58.8%) and 42 (41.2%) female undergraduate students from a public university in the Northeast.

Materials

The warning used in this study is presented as Figure 1. When present (in the message framing conditions only), the warning was placed on a flat, horizontal surface that jutted out perpendicular to the right of the hand-grip of a 6 in. (15.24 cm) *Porter Cable* brand electric circular saw. Both the signal word *WARNING* and the text were printed in black in a bold sans serif font (16-point and 12-point, respectively). The header background was a bright, saturated orange; the background of the text was white. A black 4-point border surrounded the entire warning and separated the header from the message text.

Procedure

Participants were greeted in a waiting room by the experimenter. After they completed a participant consent form, volunteers were read the following statement that described the purpose of the study:

"As you are probably aware, thousands of commercially available products require some degree of assembly (e.g., gas grills, children's toys). The instructions that accompany many of these products are poorly written and difficult for consumers to follow. We are interested in identifying better ways of writing product-assembly instructions. We have created a fictitious product for you to assemble by following step-by-step instructions. Therefore, throughout this experiment, imagine that you have just purchased a wooden birdhouse that requires assembly."

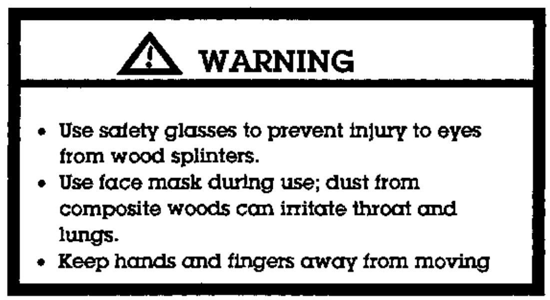

Figure 1. The warning attached to the circular saw.

After they had the statement read to them, participants were led to a room in the laboratory that was equipped to resemble a small woodworking shop. The room contained manual and (non-functional) power tools (i.e., circular saw, power drill, saws, hammer), additional items needed to complete the assembly task (e.g., wood screws, glue, clamps), and items of personal protective equipment (PPEs), including protective goggles, paper-filter masks, gloves, and a work apron. Participants were informed that they should use anything in the room they felt they needed to complete the assembly task. They were then given a set of instructions and told to begin working on the birdhouse construction task. The instructions either contained no framing message (control) or one of the three messages presented in Table 1.

At this point, the experimenter informed the participant that they would be just outside the room should they have any questions, then left the room and closed the door. If the participant had not appeared from the room after five minutes the experimenter went to ask how they were doing. If they reported that they were fine and there were no problems, the experimenter left them alone again and told them to continue. If they said there was a problem with the saw, or if the participant came out of the room to alert the experimenter to the fact that the circular saw was not working before the end of five minutes, the experimenter told the participant that the saw must be broken, terminated the task, and asked the person to complete the carpentry survey. In either instance, the experimenter recorded whether the participant had donned any of the PPEs, and if so, which ones. After completing the survey, participants were given a debriefing statement, told the session was over, and thanked for their time.

Table 1. Simple, Gain-Frame, and Loss-Frame Messages. [Note: When present, these messages were embedded in the assembly instructions.]

Simple Message

Use appropriate personal protective equipment, as directed by the safety warning located on all Porter Cable power tools

Gain-frame Message

Each year, thousands of our customers *prevent* injuries by taking the time to use appropriate personal protective equipment, as directed by the safety warning located on all Porter Cable power tools.

Using personal protective equipment increases the chances of preventing injury when using power tools.

Loss-frame Message

Each year, thousands of our customers *sustain* injuries because they do not take the time to use appropriate personal protective equipment, as directed by the safety warning located on all Porter Cable power tools.

Not using personal protective equipment decreases the chances of avoiding injury when using power tools.

Carpentry Survey

This survey was constructed to assess whether participants noticed and read the on-product warning and its contents. Questions asked if they had donned any of the PPEs before they were to use the circular saw, and if so, which ones. The survey also contained items that asked participants to rate their familiarity and experience using power tools and assembling pre-packaged kits. Several additional items assessed participants' hazard perceptions concerning the use of the saw and performing the task (assembling the pieces of the birdhouse) and the likelihood they would be injured. A final section requested basic demographic information.

Results

Hazard Perceptions

The level of hazard participants associated with (1) using the circular saw and (2) assembling the birdhouse sections (screwing together the separate parts) and the likelihood they would be injured performing each task were assessed on 9-point scales from 1=not at all dangerous/likely to 9=extremely dangerous/likely. The means and standard deviations for these measures are presented in Table 2. Overall, the mean hazard and likelihood of injury ratings were higher for the circular saw than for the assembly task. Separate one-way analyses of variance (ANOVAs) indicated that the hazard measures did not differ as a function of message framing condition, all $ps > .05$.

Table 2. Means and (Standard Deviations) for the Hazard Perception Measures.

	Task	
Perceptual Measure	*Using Saw*	*Assembling Birdhouse*
Hazardousness	5.34 (2.12)	2.91 (2.00)
Likelihood of Injury	4.01 (2.29)	2.49 (1.98)

Noticeability of the Warning Label

Table 3 presents the percentage of participants in each warning condition who reported noticing a warning on the circular saw, along with the mean noticeability rating for the warning (on a 9-point scale from 0=I didn't notice there was one to 8=extremely noticeable). Consistent with our manipulation, noticeability was significantly lower when the on-product warning was absent (control) than when it was present (i.e., in the simple, gain-frame, and loss-frame conditions), $ps < .01$. However, noticing the warning and noticeability ratings among the message framing conditions did not differ significantly from one another, $ps > .05$.

Reading of the Warning Label

Of the 77 participants who received the warning, 13 (16.9%) reported that they did *not* notice the warning label, 8 (10.4%) reported that they saw the warning but did not read it, and 56 (72.7%) reported that they noticed *and* read the warning label. Reading the warning label was positively correlated with the rated noticeability of the warning, $r = .65, p < .001$.

The percentages of participants who read the warning label as a function of message framing condition are presented in Table 3. Chi-square analysis revealed a non-significant effect for condition, $\chi^2(2) = 1.44$, $p > .05$.

Behavioral Compliance

Behavior compliance was measured by whether participants donned PPEs prior to attempting the use of the circular saw. Sixty-nine participants (67.6%) used at least one piece of safety equipment while 33 (32.4%) did not. Of the 69 who used safety equipment, 68 (98.6%) wore safety goggles, 40 (60.0%) wore the filter mask, 36 (52.2%) wore gloves, and 16 (23.2%) wore the apron. Thirty-nine (38.2% of total sample) wore both the goggles and the mask, as directed by the warning on the saw.

The extent to which participants donned appropriate PPEs as directed by the warning (i.e., wore goggles and masks) in each of the message conditions is presented in Table 3. Only 12% of participants in the no message condition donned PPEs, compared to 48%, 36%, and 56% in the simple, gain-framed, and loss-framed conditions, respectively. A one-way ANOVA conducted on these compliance data revealed a significant effect of warning condition, $F(3, 98) = 4.27$, $p < .01$. Post-hoc comparisons (also reported in Table 3) showed that compliance was significantly lower in the control condition than in the simple and loss-framed conditions.

Compliance was positively correlated with rated noticeability of the warning, $r = .37$, $p < .01$. Interestingly, compliance was also positively related to experience using a circular saw, $r = .22$, $p < .05$, but was not related to perceived danger of using the saw or of different aspects of the task ($ps > .05$).

Table 3. Effect of Warning on Noticeability, Reading, and Behavioral Compliance.

	Message Framing Condition			
Variable	**None**	**Simple**	**Gain**	**Loss**
Noticed Warning	$.28_a$	$.72_b$	$.92_b$	$.85_b$
Noticeability Rating	1.00_a	4.68_b	5.00_b	4.48_b
Read label	-NA-	$.64_b$	$.76_b$	$.78_b$
Compliance	$.12_a$	$.48_b$	$.36_{a,b}$	$.56_b$

[Note: in each row, means with different subscripts are significantly different, $p < .05$.]

Discussion

Perhaps the most important contribution of this research is that it produced a *believable* experimental context that can be used by warnings researchers as a testing vehicle in future investigations of behavioral compliance. How believable is it? As reported by Kalsher and his colleagues (1998) during the initial development of this procedure, almost none of the participants in that study discovered the true purpose of the study. In the present study, once again, only a few of the participants guessed correctly that the study involved evaluation of warnings and none of them indicated an awareness of the present investigation's additional focus on the effects of message framing.

Another important outcome was the relatively high levels of behavioral compliance observed, although one can only speculate on the cause. One possibility is to attribute it to the effectiveness of the warning, given that a majority of the participants who noticed the warning also reported reading it. Another contributing factor may have been the realism of the experimental context. Because most participants believed that they would be operating the circular saw, they may have taken extra precautions to ensure their personal safety by donning the PPEs available in the room.

An interesting departure from previous findings is that level of experience (with operating the circular saw) was *positively* related to compliance. This finding contrasts with the usual familiarity effects reported in other warnings research. However, this finding also reflects realism in the task in that experienced participants were most likely to do the safe thing; that is, use the protective equipment provided.

Finally, the study breaks new ground by investigating whether the effects of framing can increase the effectiveness of warnings as gauged by its effects both on perceptual measures (e.g., noticeability) and behavioral compliance. Although the observed differences in compliance among the three warning conditions did not reach significance, the somewhat higher compliance in the loss-framed condition suggests a promising avenue for future research.

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