

Behavioral Compliance with Safety Signs and Labels: An Update on Warnings Research

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Prepared for Themis Advocates Group

Introduction

Safety intervention efforts can involve attempts to influence how people use products or interact with their environment via signs and labels that convey safety information. A substantial body of research has investigated the questions of whether and how safety signs and labels can lead to changes in behavior and reductions in accidents and injuries. A recent review of the latest research indicates that a variety of methodologies have been used to study compliance with safety information. These methodological differences may help explain seemingly contradictory findings regarding the impact of warnings design aspects on behavioral compliance.

Behavioral Compliance with Safety Signs and Labels

Scientific research indicates that in order for safety-related information to be a mechanism of change in human behavior, multiple conditions must be met. First, an individual must receive and process the safety-related information, which requires them to seek out, notice, attend to, consume, and understand the content of that information. Numerous factors related to characteristics of the individual, the environment, the task, and the safety sign or label can affect whether and how these processes occur.¹ For example, the extent to which an individual is alert, attentive, and/or seeking information can impact the likelihood that they seek out, notice, and attend to safety-related information.² Similarly, familiarity with a product, environment, or task can impact whether and how safety messages are received or filtered out.³ Factors related to when and where safety information is presented, as well as the content of that information, can also influence whether and how safety information is received and understood.⁴

Assuming all of these events and processes take place, the user must still be willing to modify their behavior and must succeed in appropriately modifying their behavior in accordance with that information.⁵ Numerous factors can influence motivation and ability to change behavior, such as, but not necessarily limited to, the perceived consequences or risk, social factors (e.g., conformity), the perceived cost of compliance, and memory.⁶ In summary, failure to satisfy one or more of the above-noted conditions reduces the likelihood that an individual will successfully modify their behavior to comply with safety information; as such, the mere presence of safety signs and labels does not appear to reliably increase compliance or reduce accidents and injuries.

Warnings Research

As noted above, a rather substantial body of research has investigated the questions of whether and how safety signs and labels are effective in changing behavior and reducing accidents and injuries.⁷ Several review efforts that have attempted to identify trends and draw conclusions from this literature have noted a number of methodological differences in this body of research.⁸ As discussed below, these methodological differences may have important implications for conclusions drawn regarding the effectiveness of safety information in changing behavior. For example, some studies can be considered *contrived-environment experiments*; here, the research setting is artificial (often conducted in a laboratory), the task is defined by

¹ Ayres et al., 1989

² e.g., Ayres et al., 1989; deTurck & Goldhaber, 1988

³ e.g., Ayres et al., 1989; Otsubo, 1988

⁴ Ayres et al., 1989

⁵ Ayres et al., 1989

⁶ e.g., Ayres et al., 1989; Dingus et al., 1991; Friedmann, 1988; Wogalter et al., 1989

⁷ For a review, see McCarthy, et al., 1984; DeJoy, 1989; Cox et al., 1997; Ayres, et al., 1998; Silver & Braun, 1999; Rogers, Lamson, & Rousseau, 2000; Kalsher & Williams, 2006; Hancock, et al., 2020

⁸ Ayres et al., 1992; Ayres et al., 1998; Diebol et al., in press

the experimenter, and participation in the research is imposed such that participants are aware that their behavior is being observed.⁹ In these types of studies, participants may be aware of which product is of interest to experimenters (i.e., *product-obvious experiments*), or participants may not be aware that product evaluation is involved (i.e., *product-disguised experiments*).¹⁰ Other studies can be considered *real-world* studies; here, participants select their own behaviors in accordance with their goals (i.e., they are not instructed how to behave by the researchers) and are unaware that they are being observed. These studies may involve *experiments* set up by researchers, or *observations* of responses to situations not created by the researchers.¹¹

Additionally, studies can substantively differ in terms of how compliance is measured. For example, some studies have measured behavioral compliance directly by observing the behavior of individuals in response to safety signs and labels. However, some researchers have suggested that intentions can reliably predict behavior,¹² resulting in a trend of substituting measures of intention and/or predicted likelihood of compliance for measures of actual behavioral compliance in studies published since 1998.¹³ Others have shown that intentions/predictions of compliance with safety signs and labels are not consistent with behavioral compliance, calling into question the validity of using such measures to infer changes in behavior.¹⁴ This inconsistency in methodology has continued despite a lack of empirical evidence establishing that intention and predicted likelihood of compliance are accurate or reliable predictors of real-world behavioral compliance, particularly in research specific to safety signs and labels.¹⁵

Most of the research conducted on compliance with safety signs and labels has used laboratory experimentation as the methodology (i.e., *contrived-environment experiments*), in which participants knew that they were participating in a research study.¹⁶ Far fewer studies have examined real-world compliance through *real-world experiments* or *observations*, in which the self-selected behavior of unaware participants was observed.¹⁷ Furthermore, measures of intention and/or predicted likelihood of compliance have often been substituted for measures of behavioral compliance.¹⁸ These differences in study design may have important implications for conclusions drawn regarding research on compliance with safety information. Notably, varying levels of behavioral compliance and predicted likelihood of compliance with safety information have been demonstrated under highly controlled (i.e., *contrived-environment*) conditions, which include both laboratory and survey research.¹⁹ However, studies examining real-world, self-selected behavior of participants who are unaware that they are being observed have not reported substantial and/or unequivocal behavior changes associated with warning labels or signs, nor have they concluded that warnings design aspects had a significant impact on behavioral compliance.²⁰

Implications for Claims

There have been frequent allegations in the areas of product and premises liability that a product is defective, or that an owner or operator of a premises breached its duty of care, by virtue of either failing to

⁹ Ayres et al., 1992; Ayres et al., 1998; Diebol et al., in press

¹⁰ Ayres et al., 1992; Ayres et al., 1998; Diebol et al., in press

¹¹ Ayres et al., 1992; Ayres et al., 1998; Diebol et al., in press

¹² Silver & Braun, 1999

¹³ Diebol, et al., in press

¹⁴ Frantz et al., 2005

¹⁵ Diebol et al., in press

¹⁶ Ayres et al. 1998; Diebol et al., in press

¹⁷ Ayres et al., 1998; Diebol et al., in press

¹⁸ Diebol et al., in press

¹⁹ Ayers et al., 1998

²⁰ Ayres et al., 1998; Diebol et al., in press

provide safety signs or labels or by failing to include specific content or formatting in existing safety signs or labels. In contrast, allegations can also center on claims that the provision of safety-related information through signs and labels is insufficient to reduce injuries or accidents and that hazards must be designed out or guarded against instead. Analyses of such issues can benefit from examination of the product or premises in question, as well as characteristics related to the involved individual, the task being performed, and any existing safety signs and labels. Furthermore, when evaluating scientific literature used to support claims that warnings either are, or are not, effective in evoking changes in behavior, consideration should be given to the reported methodology used to study and measure behavioral change.

Closing Remarks

In conclusion, despite a substantial body of research on compliance with safety signs and labels, an apparent discrepancy remains regarding the effectiveness of this safety-related information in changing behavior and reducing accidents and injuries. Namely, under highly controlled conditions, some levels of behavioral compliance with safety information have been observed, but similar findings have not been reliably and unequivocally demonstrated in real-world studies of behavior. A recent analysis of methodological differences between studies has helped clarify the nature of the differences in these findings. Relatively few studies have evaluated behavioral compliance in real-world settings, and those that have done so have not reported unequivocal behavior changes associated with warning labels or signs and have not concluded that warnings design aspects have a significant impact on behavioral compliance. Given this discrepancy in methodology and other findings in the literature, it appears that there is still no scientific basis for accurately or reliably predicting the effects of various manipulations of warnings design aspects on behavioral compliance in real-world contexts. Accordingly, responses to failure-to-warn claims can benefit from analyses of characteristics related to the individual, environment, task, and safety-related information, as well as an evaluation of the methodology of scientific literature used to support claims related to the effects of warnings on behavior.

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