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PERCEIVED PERSUASIVENESS OF PRODUCT MANUAL WARNINGS AS A FUNCTION OF STATEMENT TYPE

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The perceived persuasiveness of warning statements derived from a power sander product manual was investigated. The content of the statements varied in several ways: the presence of a consequence statement, the form of injury statistics (percentages, frequencies, or none), the magnitude of the statistical value, and the quality of the statement. Participant ratings showed that a consequence statement together with directive and instruction statements were the most persuasive. For injury frequency statistics, high quality statements increased persuasion compared to low quality statements. Larger percentages produced greater persuasion ratings compared to smaller percentages. Implications for the design of product manual warnings are discussed.

Introduction

Most warning literature has examined differences in physical form and location (e.g. color, size, layout, presence of symbols, and placement). Although some research has examined aspects of content such as signal words, color and symbols (e.g. Laughery *et al*, 1994, Wogalter *et al*, 2001), much less research has been conducted on statement content. For example, prior research on statement content has noted that messages including hazard, consequence and instruction statements were rated more effective than without these statements (e.g. Wogalter *et al*, 1985). Statements with greater implied injury severity were rated as connoting greater hazard than statements with lower implied severity (Wogalter and Barlow, 1990). Moreover most of the prior evaluations of statement content have used ratings of perceived hazard, perceived effectiveness, or willingness to comply. One measure that has not been used in warning research is the degree to which the message is persuasive. Warnings are in some sense persuasive communications. Greater persuasion may change beliefs and attitudes which could help motivate compliance behavior (Wogalter *et al* 1999).

Most research on warnings has concerned signs and labels. Very few studies have systematically manipulated components of product manuals. Research has found that highlighting and including symbols benefits memory and comprehension (Young and Wogalter, 1990) and priority ordering of statements facilitates subsequent recall (Vigilante and Wogalter 1999). Product manual warnings are different than other kinds of warnings because they are embedded in the context of a large amount of non-warning information. For example, many power tool manuals include general work-related statements (e.g. Keep work area clean) or technical information. This non-warning

information is likely to be less persuasive than warning information. However, the extent to which a warning is persuasive may depend on several factors. One is whether it contains all necessary information such as consequences (Wogalter *et al*, 1985). Another potential factor affecting warning persuasiveness is whether it contains statistical (quantitative) information about accidents and injuries. Conzola and Wogalter (1998) found that warnings with quantitative information were perceived as more important, vivid and explicit. However, that study did not measure the persuasiveness of the messages. In the present study, the form of statistical presentation was manipulated. The statistics either used numerical frequencies (e.g. approximately 2,500 persons suffer eye injuries each year) or numerical percentages (e.g. approximately 35% of all power sander injuries involve injuries to the eyes).

Another potential factor affecting warning persuasiveness is whether the statement contains high quality, relevant information versus low quality, irrelevant information. In the present research, a high quality warning is operationally defined as one that implies a large number of power sander accidents having occurred in the past. A low quality warning statement is one that either implies that there have not been very many power sander accidents, or gives irrelevant information (e.g. the number of accidents with power tools in general). If the quality of the warning statement is a factor, then the number of power sander accidents implied by the warning statement (low versus high) would affect perceived persuasiveness. Additionally, the persuasiveness of a statistic may depend on its magnitude, independent of the quality of the statement. Large statistical values do not necessarily imply a large number of accidents (e.g. if the statistic is irrelevant to the number of power tool accidents).

The goal of this research was to investigate the persuasiveness of several different types of warning statements derived from a power sander product manual that were manipulated as a function of the above-named factors.

Method

Participants

Eighty-seven North Carolina State University undergraduate students (35 males and 52 females) enrolled in introductory psychology classes participated for research credit towards a laboratory participation requirement. There was considerable variation in the degree programs with which the students were affiliated.

Procedure and Materials

The present research was part of a larger study. Participants were shown a list of different warning statements derived from existing power sander product manuals, and asked to rate the statements on how convincing each was in supporting the claim that the power sander is potentially hazardous and caution should be taken when using it (using similar methodology as Petty and Cacioppo, 1986). All statements were rated on a 7-point Likert-type scale (1 = not at all convincing, 7 = extremely convincing).

Table 1. Examples of warning statement types

Statement type	Example
Directive, consequence, and instruction (what to do, why and how)	Secure work. Unsecured work could be thrown towards the operator causing injury. Use clamps or vice to secure work.
Technical information only (no information about hazard)	To avoid damage, do not exceed a +/- 10% voltage variation or a +/- 3% frequency variation
General work-related statements (no information about hazard)	Know your power tool. Read operator's manual carefully.
High quality statements using percentages (larger and smaller)	Approximately (35%/4%) of (eye injuries from power tools/all eye injuries) are suffered while using power sanders.
Low quality statements using percentages (larger and smaller).	Approximately (35%/4%) of all power sander injuries involve injuries to the eyes.
High quality statements using numerical frequency values (larger and smaller)	Approximately (2,500/100) persons suffer eye injuries each (year/month) while using power sanders.
Low quality statements using numerical frequency values (larger and smaller)	Approximately (2,500/100) persons have suffered eye injuries (since 1975/each year) while using power tools.

There were a total of 99 different statements representing 13 different statement types (grouped according to statement content). However, each participant only rated a subset of the total statements to avoid fatigue. The statements were divided into four different groups, and each participant rated only the statements from one group. The order of the statements within each group was randomized.

The power sander product was selected based on the results of an earlier, related study showing it to be a product that this population of participants was not familiar with and perceived to be moderately hazardous.

The warning statements mainly concerned eight common hazards associated with this power tool (hair/clothing getting caught in moving parts; unsecured work being thrown; dust or foreign objects injuring eyes; dust and debris injuring lungs; electrical shock; hearing damage; lacerations from accidental starting; and fires from sparks). For statements using statistics, the larger and smaller values were designed to be as far apart as possible while still remaining credible. Table 1 shows example statements. Table 2 gives the entire set of 13 statement types.

Results

The mean rating for each statement type was computed across all participants. An analysis of variance conducted on the mean convincingness score showed that statement type was significant ($p < .0001$). Table 2 shows the means and standard deviations for each of the 13 statement types. The subscripts in the table show significant differences between the statement types. Only a subset of the comparisons are described in this section.

Table 2. Mean convincingness ratings for statement types

Statement type	*M*	*SD*
Directive, consequence, and instruction	4.64_a	1.66
Statistical information using numerical values (larger) that suggest a high number of overall power sander accidents	4.22_b	1.65
Statistical information using percentages (larger) that do not give any information about the overall number of power sander accidents	4.10_b	1.48
Statistical information using numerical values (smaller) that suggest a high number of overall power sander accidents	4.02_b	1.58
Statistical information using percentages (larger) that suggest a high number of overall power sander accidents	3.95_b	1.45
Only technical information	3.56_c	2.05
Only the consequence	3.51_c	1.61
Directive and instruction (no consequence)	3.50_c	1.83
Statistical information using numerical values (smaller) that do not give any information about the overall number of power sander accidents	3.41_c	3.41
Statistical information using numerical values (larger) that do not give any information about the overall number of power sander accidents	3.22_{cd}	1.62
Statistical information using percentages (smaller) that suggest a high number of overall power sander accidents	2.98_d	1.37
Statistical information using percentages (smaller) that do not give any information about the overall number of power sander accidents	2.94_d	1.44
General work-related statements	2.52_e	1.76

Notes: 1 = Not at all convincing, 7 = Extremely convincing
Means with similar subscripts are not significantly different

Comparisons showed that statements with the three components (directive, consequence, and instruction) had the highest ratings ($M = 4.64$, $SD = 1.66$), and were rated as significantly more convincing than statements with (a) only a directive and

instruction (M = 3.50, SD = 1.83), (b) only the consequences of the hazard (M = 3.51, SD = 1.61), or (c) only technical information (M = 3.55, SD = 2.05). The latter three statement types did not differ from each other ($p > .05$), but all were rated more convincing than general work-related statements (M = 2.52, SD = 1.76).

With frequency statistics, the high quality statements were rated more convincing than low quality statements, but there were no differences as a function of numerical magnitude (for high quality: small frequency, M = 4.02, SD = 1.58, and large, M = 4.22, SD = 1.65, and for low quality: small frequency, M = 3.41, SD = 3.41, and large, M = 3.22, SD = 1.62).

The pattern was somewhat different when statistics were presented as percentages. Statements using larger percentage values were significantly more convincing than statements using smaller percentage values. There were no significant differences between high quality (for large percentages, M = 3.95, SD = 1.45, and small, M = 2.98, SD = 1.37) and low quality (for large percentages, M = 4.10, SD = 1.48, and small, M = 2.94, SD = 1.44) statements.

Discussion

The results showed that the most effective warning statements were those that included a directive, consequence and instructions, and that removing the consequence, or using only the consequence had a negative impact on the perceived persuasiveness of the statement. This finding is similar to Wogalter *et al* (1987) who found that that when the signal word, hazard statement, consequent statement, or instruction statement was removed, the warnings were perceived to be less effective.

When using injury statistics, results were slightly different depending on the type of statistic. When frequency statistics were used, it appeared that the quality of the information being conveyed (e.g. how many power sander accidents it suggested) was more important than the magnitude of the statistic. However, when the statistics were percentages, it was the magnitude of the percentage that seemed to be more important than the quality of the information conveyed by the statistics. This suggests that in some situations, including statistics with small values may reduce the persuasiveness of the warning statement.

General work-related statements were significantly less persuasive than all other statement types. Technical statements were also not very persuasive. Both of these types of statements are commonly included in product manual warnings.

Note that the statement with the highest ratings had no statistics at all. However, the next group of statements all had some sort of statistic. Future research could examine the effectiveness of combining the directive, consequence and instructions with statistical information to determine whether the combination produces a higher level of persuasiveness than those used in the present study.

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