Predicting Propensity to Actively Care for Occupational Safety[1.]

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Abstract

A 154-item safety culture survey (SCS) was administered to the employees of two industrial plants to test a model designed to predict individuals' willingness to "actively care" (AC) for the safety of coworkers. A total of 530 surveys were completed at a mean return rate of 89%. The regression analysis at each site (R^2 = .267 and .466) showed the same four subscales on the SCS (i.e., measures of personal control, group cohesion, extroversion, and reactance) to predict independent variance in employees' reported willingness to AC. Furthermore, a higher percentage of scales hypothesized to predict AC were significantly correlated with AC (i.e., 90 percent) than the scales hypothesized not to predict AC (i.e., 50 percent). Therefore, the results were largely consistent with theory (i.e., our AC model), except for the prominent impact of reactance on AC propensity. Thus, the results showed convergent and divergent validity of the AC model, while also suggesting specific theory refinements.

Introduction

Numerous researchers have reported significant improvement in individual and group work performance following a behavior-based feedback process (e.g., Geller, Eason, Phillips, & Pierson, 1980; Komaki, Heinzmann, & Lawson, 1980; Sulzer-Azaroff & de Santa Maria, 1980). This approach to organizational behavior management, whereby workers receive specific feedback from systematic observation and recording of designated target behaviors, has been applied frequently and successfully to reduce work injuries (e.g., Krause, Hidley, & Hodson, 1989; Sulzer-Azaroff, 1982, 1987). However, the research demonstrating the beneficial impact of behavioral observation and feedback on occupational safety has usually been short-term and small-scale, requiring outside agents (or consultants) to help implement the process. Large-scale and long-term application of behavior-change techniques requires the employees themselves to apply the interventions (e.g., systematic behavioral observation and feedback) throughout the workplace.

Geller (1991) addressed the need to get employees actively involved in implementing behavior-change processes with the introduction of an “actively caring" model. In the context of occupational safety, actively caring (AC) was operationally defined as employees acting to benefit the safety of other employees (e.g., observing and recording the safe and unsafe behaviors of coworkers, and then giving them constructive behavioral feedback). From a review of the social/personality literature, Geller (1991) proposed that three personality states or expectancies, modified by work-place situations and interactions, influence employees’ propensity to AC for another person’s health or safety.

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Specifically, individuals most likely to AC were presumed to have relatively high self-esteem ("I am valuable"), group cohesion ("I belong to a group"), and optimism ("I expect the best"). Support for this AC model was found in research showing that subjects were more likely to intervene in a bystander intervention paradigm when a) their self-esteem was relatively high (Michelini, Wilson, & Meese, 1975; Wilson, 1976), b) they felt close to group members (Rutkowski, Gruder, & Romer, 1983), and c) they were in an optimistic mood after finding a dime, receiving a packet of stationary, listening to soothing music, being on a winning football team, imagining a vacation in Hawaii, or being labeled a charitable person (Carlson, Charlin, & Miller, 1988).

Roberts and Geller (in press) tested the AC model by giving 65 hourly workers from one department of a large fiber-manufacturing plant a survey with subscales measuring self-esteem (Rosenberg, 1965), group cohesion (Wheeless, Wheeless, & Dickson-Markman, 1982), and optimism (Scheier & Carver, 1985, 1993). Embedded in this questionnaire were three 5-point agree/disagree questions assessing willingness to AC (e.g., "I am willing to warn my coworkers about working unsafely"). About two months later, these employees were introduced to an "AC thank-you program" whereby they could distribute AC thank-you cards to their coworkers for certain AC safety behaviors. Self-esteem, optimism, and group cohesion scores predicted significant and independent variance in self-reported willingness to actively care ($\underline{R}^2 = .362$), and those workers who either gave or received a thank-you card scored significantly higher on measures of self-esteem and group cohesion than employees who did not give or receive a thank-you card.

The present study followed up the research of Roberts and Geller by giving an expanded and refined questionnaire to a much larger sample of employees (n = 592). By replicating the survey administration across two companies, it was possible to conduct a cross validation analysis; and by including subscales predicted to be unrelated to AC propensity (i.e., measures of risky lifestyles, cognitive failures, and psychological reactance), we could obtain estimates of convergent and divergent validity. In addition, an expanded survey was administered in the present research because we modified our AC model to include four rather than three predictors of AC propensity. More specifically, we hypothesized propensity to AC to be a function of self-esteem, belongingness (or group cohesion), and empowerment (Geller, Roberts, & Gilmore, 1992). The empowerment construct (implied by the self-affirmation, "I can make a difference") was presumed to vary directly with perceptions of optimism (Scheier & Carver, 1985, 1993), and personal control (Rotter, 1966; Nowicki & Duke, 1974). Whereas Roberts and Geller (in press) used only three survey questions to assess propensity to AC for safety, the survey for the present research included nine AC items. These AC items addressed employees' willingness to go beyond the call of duty to give a coworker feedback about their safe and unsafe behaviors (e.g., "I am willing to warn other coworkers about working unsafely"), and to look out for environmental safety hazards and take appropriate corrective action when warranted (e.g., "I am willing to pick up work-place litter that I did not cause myself").

Actively caring (as we have operationalized the term in our survey) usually requires a person to interact with other people on behalf of their behaviors or an environmental risk, and thus it's possible more outgoing individuals (e.g., extroverted) will score higher on our measures of AC behaviors than employees less sociable and more reserved (e.g., introverted). Therefore, we included a measure of extroversion (Eysenck & Eysenck, 1985) in our survey, and hypothesized a direct relationship between extroversion and propensity to AC for occupational safety.

Method

Subjects and Setting

Employees at a plastics manufacturing plant (n=374) in Texas (Site 1) and a textiles manufacturing plant (n=218) in North Carolina (Site 2) were administered a Safety Culture Survey (SCS) by area supervisors, with assistance by one of the authors. The majority of the employees were either maintenance or operations personnel, although all supervisory staff also took the survey. The survey return rate was 86 percent for Site 1 and 92 percent for Site 2.

The Safety Culture Survey (SCS)

The SCS included measures of person factors hypothesized to predict one's propensity to actively care (AC) for the safety of others interspersed with questions regarding workers' perceptions of plant safety and measures of psychological reactance and cognitive failures. Each of the 154 items of the SCS were answered with a 5-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Six subscales were included and hypothesized to predict willingness to AC: a) self-esteem (16 questions) from Rosenberg's (1965) Self-Esteem Scale, b) optimism (8 questions) from Scheier and Carver's (1985) Life Orientations Scale, c) personal control (25 questions) from the Nowicki-Strickland Internal-External Scale (Nowicki & Duke, 1974; Strickland, 1989), d) group cohesion (20 questions) from the Wheeless, Wheeless, and Dickson-Markman (1982) Group Cohesion Measure, and e) extroversion (9 questions) from the Extroversion/Introversion scale of the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1985). Each subscale was refined slightly from the original to fit a corporate culture.

The SCS included three personality measures hypothesized not to predict AC propensity: a) psychological reactance (12 questions) based on the Merz Psychological Reactance Scale (Merz, 1983; Tucker & Byers, 1987), b) cognitive failures (26 questions) from the Cognitive Failures Scale developed by Broadbent et al. (1982), and c) a Risky Lifestyles Scale (29 questions) developed by the authors to predict personal injury rate on the job (Geller, Roberts, & Gilmore, 1992).

The SCS also included a subscale to measure willingness to AC (i.e., the AC subscale). The three items used in the original AC subscale (Roberts & Geller, in press) were expanded to include the following nine questions:

a) If I know a coworker is going to do a hazardous job, I am willing to remind him/her of the hazards (even if the employee is familiar with the job); b) I feel comfortable praising my coworkers for working safely; c) I am willing to warn other coworkers about working unsafely; d) I am willing to do whatever I can to improve safety, even confronting other coworkers about their unsafe acts; e) I am willing to observe the work practices of a coworker and record his/her safe and unsafe behaviors; f) I am willing to pick up after another employee to maintain good housekeeping; g) When I see a potential safety hazard (e.g., oil spill), I am willing to correct it myself if possible; h) I am willing to pick up work-place litter that I did not cause myself; i) If I notice an unsafe feature in the equipment outside my work area, I am willing to take corrective action (e.g., notify my supervisor or complete appropriate paperwork). All 154 items of the SCS were intermixed randomly, with no two items of the same subscale occurring serially.

Procedure

During area safety meetings, the subjects from both sites received the SCS from their supervisors, who introduced it as an information gathering tool to find both good and bad aspects of the safety climate at their plant. No names were included on the SCS to identify subjects and the employees were told their answers would be completely anonymous, although codes were used to categorize the surveys according to department or work group. The survey took approximately one hour to complete. Site 1 received the SCS in November, 1992; Site 2 received the SCS in December, 1992.

Results

Inter-item Reliability

An internal consistency analysis was used to estimate the reliability of each SCS subscale (Murphy & Davidshofer, 1988). Table 1 lists each subscale, the number of scale items, and Chronbach's alpha for both Site 1 and Site 2.

Subscale	Number of Items	Site 1 Alpha (n=328)	Site 2 Alpha (n=202)
Self-Esteem	16	.80	.79
Group Cohesion	20	.90	.89
Optimism	8	.75	.69
Personal Control	25	.73	.73
Extroversion	9	.69	.72
Reactance	12	.74	.75

Cognitive Failures	26	.90	.92
Risky Lifestyle	29	.80	.77
Actively Caring	9	.79	.83

Table 1. Each Scale from the Safety Culture Survey, the Number of Scale Items, and The Scale Alpha for Sites 1 and 2

Relationships Between Subscales

Table 2 depicts the correlations between each SCS subscale for Site 1 and Site 2. At both sites, the highest inter-subscale correlations occurred between the three subscales measuring self-esteem, personal control, and optimism. Also for both sites, the AC subscale correlated significantly ($p < .01$) with each of the subscales predicted to influence AC propensity (i.e., self-esteem, group cohesion, optimism, personal control, and extroversion). The measure of cognitive failure correlated negatively with self-esteem, optimism and personal control at both sites, and at one site cognitive failures correlated significantly (and inversely) with the AC subscale. Table 2 also depicts significant negative relationships between reactance and the AC subscales at both sites. All of the reliable correlations were notably higher at Site 2 than Site 1.

Site 1

	SE	GC	Op	PC	Ex	Rx	C F	R L	AC
Self-Esteem (SE)	--								
Group Cohesion (GC)	0.21	--							
Optimism (Op)	0.60	0.27	--						
Personal Control (PC)	0.48	0.20	0.44	--					
Extroversion (Ex)	0.23	0.08	0.18	0.02	--				
Reactance (Rx)	-0.18	-0.24	-0.29	-0.30	0.00	--			
Cognitive Failures (CF)	-0.30	-0.13	-0.27	-0.21	0.13	0.28	--		
Risky Lifestyle (RL)	-0.02	0.01	-0.09	0.02	0.08	-0.03	0.17	--	
Actively Caring (AC)	0.25	0.29	0.28	0.39	0.13	-0.38	-0.09	0.01	--

Site 2

	SE	GC	Op	PC	Ex	Rx	C F	R L	AC
Self-Esteem (SE)	--								
Group Cohesion (GC)	0.15	--							
Optimism (Op)	0.64	0.23	--						
Personal Control (PC)	0.58	0.23	0.58	--					
Extroversion (Ex)	0.30	0.26	0.21	0.30	--				
Reactance (Rx)	-0.25	-0.31	-0.36	-0.26	0.04	--			
Cognitive Failures (CF)	-0.50	-0.16	-0.43	-0.39	-0.03	0.31	--		
Risky Lifestyle (RL)	-0.01	-0.16	-0.09	-0.01	0.14	0.12	0.04	--	
Actively Caring (AC)	0.36	0.41	0.41	0.45	0.41	-0.47	-0.29	-0.07	--

Table 2. Correlations Between Each Subscale of the Safety Culture Survey at Site 1 (n=328) and Site 2 (n=202). Correlations of .18 or higher are significant at the .01 level.

Regression Analyses

Site 1 regression. A stepwise multiple regression (Norûsis, 1990) was performed with the Site 1 AC subscale scores as the dependent variable and self-esteem, optimism, personal control, group cohesion, psychological reactance, extroversion, risky lifestyles, and cognitive failures as the independent variables. Table 3 presents the independent variables for each step, the partial r, model R, R^2, and t values for the partial r. The model R^2 (.27) was significantly different than zero after four steps $F(4, 323) = 27.7$, $p < .001$. The four variables included in the regression equation were personal control, reactance, group cohesion, and extroversion.

Step	Variable	Partial R.	Model R	R^2	t	
1	Personal Control		.39	.15	7.57	**
2	Reactance	-.30	.48	.23	-5.67	**
3	Group Cohesion	.19	.51	.26	3.54	**
4	Extroversion	.13	.52	.27	2.35	*

Table 3. Multiple Stepwise Regression with Site 1 AC Subscale Scores as the Dependent Variable and Self-Esteem, Optimism, Personal Control, Group Cohesion, Psychological Reactance, Extroversion, Risky Lifestyles, and Cognitive Failures as Independent Variables (n=328) * $p < .05$ ** $p < .01$

Cross validation. Because a relatively large number of variables (i.e., 8) was used to predict propensity to AC, the potential for capitalizing on chance could lead to an inflated R. Therefore, the Site 1 regression equation was cross validated (e.g., Stephens, 1992) using the SCS data from Site 2. As shown in Table 4, the variance explained in AC scores at Site 2 ($\underline{R}^2$=.31) from applying the Site 1 regression equation to the Site 2 data was actually higher than the variance explained in Site 1 AC scores predicted with Site 1 data ($\underline{R}^2$=.27).

	R	R^2	F	
Site 2 AC Predicted by Site 1 Regression Equation†	.55	.30	84.3	**

Table 4. Site 1 Regression Cross Validated Using Site 2 Data ** p< .01
† $\hat{y}$ =21.6 + .272(Personal Control) + -.259(Reactance) + .168(Group Cohesion) + .11(Extroversion)

Site 2 stepwise regression. To determine whether the same variables included in the Site 1 regression equation would also be included for Site 2, a stepwise multiple regression was performed with the Site 2 AC subscale as the dependent variable and the other SCS subscales as independent variables. As depicted in Table 5, the same four factors (i.e., personal control, reactance, group cohesion, and extroversion) that entered into the Site 1 regression equation also entered into the Site 2 regression equation, although not in the same order. The model $\underline{R}^2$ (.47) was significantly different than zero after four steps, $\underline{F}(4, 179) = 43.1$, $\underline{p} < .001$.

Step	Variable	Partial R.	Model R	R^2	t	
1	Reactance		.47	.22	-7.52	**
2	Extroversion	.48	.63	.40	7.75	**
3	Personal Control	.27	.67	.45	3.98	**
4	Group Cohesion	.20	.68	.47	2.80	**

Table 5. Multiple Stepwise Regression Analysis with the Site 2 AC Subscale as the Dependent Variable and Self-Esteem, Optimism, Personal Control, Group Cohesion, Psychological Reactance, Extroversion, Risky Lifestyles, and Cognitive Failures as Independent Variables (n=202)** p< .01

Convergent and Divergent Validity

Convergent validity was estimated by calculating the correlations between each of the scales hypothesized to predict AC (i.e., self-esteem, optimism, personal control, group cohesion, and extroversion) and the ACS for Sites 1 and 2. All scales hypothesized to

correlate with the ACS except one (i.e., extroversion at Site 1) were significantly correlated with the ACS. In other words, nine of the 10 correlations (i.e., five measureas at two sites) hypothesized to be significantly correlated with the ACS were significantly correlated with the ACS.

Divergent validity was estimated by calculating the correlations between each of the scales hypothesized not to predict AC (i.e., psychological reactance, risky lifestyles, and cognitive failures) and the ACS for Sites 1 and 2. Three of the six correlations (i.e., risky lifestyles at both sites and cognitive failures at Site 1) were not significant.

	Self Esteem	Group Cohesion	Optimism	Personal Control	Extroversion
Site 1	.25	.29	.28	.39	.13
Site 2	.36	.41	.41	.45	.41

Table 6. Convergent Validity Estimate: Variables Hypothesized to Predict Actively Caring Correlated With the AC Subscale

	Reactance	Cognitive Failures	Risky Lifestyles
Site 1	-.38	-.09	.01
Site 2	-.47	-.27	-.07

Table 7. Discriminant Validity Estimate: Variables Hypothesized Not to Predict Actively Caring Correlated with the AC Subscale

Discussion

Geller et al. (1990) introduced a system for categorizing behavior change techniques and developing a more systematic approach to designing intervention programs to fit a particular behavioral problem, target audience, and organizational culture (see also Geller, 1992). Interventions were categorized into multiple levels or tiers, each level defined by its intrusiveness and cost-effectiveness. At the top of the "multiple intervention hierarchy" (i.e., Level 1), the interventions are least intrusive and target the maximum number of persons for the least cost per person. At this level, intervention techniques (e.g., attempts to activate behaviors through signs, billboards, and public service announcements) are designed to have maximum large-scale appeal with minimal

personal contact between target individuals and intervention agents. Geller et al. hypothesized that those individuals uninfluenced by initial exposure to these types of interventions (i.e., Level 1) will be uninfluenced by repeated exposures to interventions at the same level of cost-effectiveness. These individuals require a more intrusive and costly (i.e., higher level) intervention.

Higher level (and more influential) intervention processes require increased costs in terms of materials and personnel (i.e., intervention agents). Compared to signs, lectures, and policy statements, for example, an observation and feedback process changes the behavior of more individuals; but such programs are much more costly to implement with regard to personnel, materials, and effort. These programs are in fact wasted on individuals who already emit the target behavior, but are necessary for "hard-core" resistant (perhaps reactant) individuals who are not influenced by behavior change techniques less intensive, less intrusive, and less costly. In the job setting, it is important to develop and implement higher-order (more intrusive and costly) intervention processes for the more resistant employees. These higher-level intervention processes require the active assistance of other employees.

A key proposition in the multiple intervention level model proposed by Geller et al. (1990) and refined by Geller (1992) is that individuals influenced by an intervention program (at a particular level of cost effectiveness and intrusiveness) should not be targeted for further intervention, but rather should be enrolled as intervention agents for the next (i.e., higher) level of behavior change intervention. In other words, "preaching to the choir" is not as beneficial as enlisting the "choir" to preach to others (cf. Katz & Lazarfeld, 1955).

Indeed, employee involvement is a key issue in almost every recent publication addressing the human element of occupational safety (e.g., Carder, 1994; Montante, 1994; Shields, 1994). The actively caring (AC) model introduced by Geller (1991, 1994) and refined by Geller, Roberts, and Gilmore (1992) was designed as a heuristic to a) identify those employees most likely to become intervention agents for organizational behavior change, and b) guide the development of intervention strategies for increasing the probability that employees will become intervention agents. This latter purpose has substantial potential for beneficial application in real-world settings. For example, if certain personality states or experiences reliably predict propensity to actively care (AC) or get involved in an extra safety effort, then a case could be made for implementing intervention techniques to increase these states or expectancies.

The present research demonstrated that certain person factors predicted by the AC model did predict employees' willingness to AC at both industrial sites. Three of the five personality factors hypothesized to influence AC behavior predicted independent and significant variance in employees' reported willingness to AC for the safety of other coworkers. The two factors which did not enter into the regression equations (i.e., self-esteem and optimism) correlated highly with personal control and the AC subscale. Thus, the measures of self-esteem, optimism, and personal control predicted overlapping variance in propensity to AC, with personal control having the most predictability.

The use of the same self-report measure to provide both the independent and dependent variables leads to two potential problems. First, there was no direct measure of a safety-related behavior. Therefore, the extent to which these self-reports correspond to actual safety-related behaviors could be questioned. However, Roberts & Geller (1995) found self-reports of AC behaviors (i.e., the number of AC Thank You Cards given and received) in a similar group of workers to match exactly with the number of AC Thank You Cards turned in to the experimenters.

A second potential problem with the use of the same self-report measure to provide both the independent and dependent variables is that common method variance could lead to significant correlations among predictor and criterion variables. For example, subjects could have simply answered all questions in the most socially desirable way. However, because no names were included on the SCS, subjects were assured they could not be identified, and it was stressed that the SCS was an information gathering tool to find both good and bad aspects of the safety climate, it is likely there were low demand characteristics for socially desirable responses. However, to further rule out the possibility of common method variance as the cause of the current results, estimates of both convergent and divergent validity were obtained by examining the correlations between the scales hypothesized to predict and hypothesized not to predict AC.
The correlations in Tables 6 and 7 suggest both convergent and divergent validity. In other words, a higher percentage of scales hypothesized to predict AC were significantly correlated with the ACS (i.e., 90 percent) than the scales hypothesized not to predict AC (i.e., 50 percent). However, the correlations between reactance and the ACS were substantial (i.e., giving the highest average across the two sites), thus weakening the evidence for divergent validity and suggesting certain modifications in our AC model as discussed below.
The cross validation analysis resulted in reasonably high predictability of Site 2 AC propensity (R2=.31) with the regression equation derived from Site 1 data. The four person states which consistently predicted significant and independent variance in the AC subscale were personal control, group cohesion, extroversion, and reactance. Reactance was not hypothesized to be a significant predictor of AC behavior, but the negative relationship between reactance and willingness to go beyond the call of duty for occupational safety is reasonable from post hoc considerations.

Specifically, occupational safety is typically perceived as following top-down policies and mandates, and compliance with safety rules is usually managed with fault-finding investigations, interpersonal confrontations, discipline sessions, and letters of condemnation. Given a top-down, rule-enforcement perception of corporate safety, it seems reasonable that persons scoring high on reactance would be relatively unwilling to go beyond the call of duty and AC for the safety of other employees. Thus, this post hoc interpretation of our findings warrants an extension of our AC model. Our next test of the AC model will include reactance as a predictor of propensity to AC.

The high correlations between self-esteem, optimism, and personal control suggests substantial redundancy in these constructs (as they were assessed in this research), at least with regard to influencing propensity to AC. Actually, when we have asked employees

to operationalize these person factors by listing procedures and situations that increase and decrease these states, we have found substantial overlap between lists (Geller et al., 1992). Likewise, when we ask employees to suggest action strategies for independently increasing self-esteem, optimism, and personal control, the same basic strategies are suggested for each concept (e.g., increase positive recognition programs, listen actively with empathy, set realistic and trackable goals, treat others with respect, consider safety as achievement rather than loss-control, hold people accountable for processes to reduce injuries rather than the company's injury rate, and celebrate "small win" accomplishments of safety achievement goals). The results of the present research supported this observation from employee workshop discussions. Follow-up research is needed to study the unexpected negative relationship between reactance and reported willingness to AC, and to determine whether characteristics or skills of extroverts which make them more willing to AC could be taught at employee training sessions.

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