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OUTCOMES OF A LEADERSHIP INTERVENTION FOR A METROPOLITAN FIRE DEPARTMENT[1,2,3]

RANDAL BEATON, L. CLARK JOHNSON

Department of Psychosocial and Community Health
School of Nursing University of Washington

SUSAN INFIELD

Human Engineering Research Associates
Phoenix, Arizona

TERRY OLLIS

City of Everett Fire Department

GAIL BOND

University of Washington

Summary.—Poor leadership can contribute to job dissatisfaction and employees' "burnout." Perceived lack of leadership skills is also a source of stress for supervisors. This study evaluated the efficacy of a brief multicomponent leadership intervention provided for fire service supervisors in an urban fire department. Ratings by 51 line firefighters and 8 first-line supervisors documented improvements in their immediate supervisors' performance at 3 mo. postintervention. Self-reports by line firefighters also showed improvements in perceptions of their ability to attain career goals, which were sustained at 9 mo. postintervention. There were also improvements on certain stress-related symptoms indices reported by the sample of firefighter supervisors at both the 3-mo. and 9-mo. follow-ups. No significant changes on any of these measures, obtained at comparable time points, were observed in a (nonequivalent) control sample of firefighters and their first-line supervisors in an "untreated" urban fire department.

Effective leadership in any hierarchical organization contributes significantly to organizational success. Yet most professional fire service officers in the United States have received little formal management training (Gist & Woodall, 1995). In this paper we examined the benefits of a brief, multicomponent leadership training intervention offered to a sample of first-line fire service supervisors in an urban fire department. Subjective and objective outcome measures were obtained from line firefighters and first-line supervisors prior to this intervention, e.g., baseline, and at 3 and 9 months post-

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[3]Address enquiries to R. Beaton, Department of Psychosocial and Community Health, School of Nursing, University of Washington, PO Box 357263, Seattle, WA 98195-7263.

intervention. These same measures at the same time points were available from comparable fire service personnel in a similar fire department, which served as an untreated control group. Although the participants in the experimental and control fire departments were not randomly assigned, the observational structure conformed with a quasi-experimental time-series design used to assess the equivalence of the treatment and control groups on the measures employed, as well as the contributions of history, maturation, and testing (Campbell & Stanley, 1966). In addition, this study evaluated the potential cost-effectiveness of this intervention for the "treated" urban fire department.

Significance of the Problem

Professional fire fighting is an inherently stressful and dangerous occupation that currently ranks fifth in terms of occupational mortality in the United States and has one of the highest on-the-job injury rates (IAFF, 1997). In fact, in terms of lost work hours, the injury and illness rate of American firefighters measured six times higher in 1996 than the average for all American workers in private industry (IAFF, 1997). Nationwide, more than 40% of all firefighters experienced a job-related injury or an occupational illness in 1997. Furthermore, compared to community samples and other occupational groups, professional firefighters display higher prevalence of many stress-related disorders including Posttraumatic Stress Disorder (PTSD) (Corneil, Beaton, Murphy, Johnson, & Pike, 1999), gastrointestinal as well as other pain complaints (Beaton, Murphy, & Pike, 1996) and sleep dysomnias (Beaton, Murphy, Pike, & Jarrett, 1995).

Poor supervision leads to or exacerbates job dissatisfaction and has been shown to contribute to occupational distress in emergency medical technicians (Revicki & Gershon, 1996). In conjunction with such employee-subordinate issues, an additional source of stress and distress for firefighter supervisors is their own perceived lack of leadership training and management skills. According to the International Association for Firefighters (IAFF), the fire service had one of the highest on-the-job mortality rates in the United States workforce in 1997 (IAFF, 1997). In fire departments nationwide, poor supervision can put subordinates, coworkers, and citizens at risk in emergent life-or-death situations.

Since most fire departments in the United States adhere to a hierarchical command structure with paramilitary traditions, firefighters must also deal with organizational and leadership stressors such as conflicts with their supervisors and subordinates, role conflicts, role ambiguity, and associated role strain (Goode, 1960; Hartsough, 1985). All work organizations experience some interpersonal and organizational conflicts, but the rigid administrative structures of many fire departments and a dependence on team work

in tight knit "crews," under suboptimal conditions, may magnify the significance of such interpersonal conflicts. In fact, in a large scale study ($N \sim 2000$) of firefighters, Beaton and Murphy (1993) found that "perceived labor-management conflict" was the occupational stressor most robustly and most consistently correlated with reports of job dissatisfaction. The National Institute for Occupational Safety and Health (NIOSH) model of stress and health (Hurrell, 1987) emphasized the relationship between leadership and stress-related health outcomes in workers. If management styles and interpersonal relations can exacerbate job stressors, then supervisors within the fire department need to recognize and counteract these stressors to ensure that their crew functions well.

In Washington State, as in most North American states and municipalities, most professional firefighter supervisory personnel receive little formal leadership training or management education. A training program in leadership management for fire service personnel could potentially represent a cost-effective intervention by decreasing such organizational outcomes as employee absenteeism (Jacobson, Aldana, Goetzel, Vardell, Adams, & Pietras, 1996). Furthermore, since fire service supervisors in U.S. urban fire departments appear to be at increased risk for certain adverse consequences of job-related stress, a tailored leadership intervention could potentially have a positive influence on the work environment and job performance of both urban fire service supervisors and their subordinates (Beaton, 1997; Corneil, *et al.*, 1999).

Review of the Literature

Prior studies have documented that the psychosocial relationship between leaders and subordinates affect the leadership process (Fiedler, 1967; House, 1971; Schriesheim & Stogdill, 1975; Graen & Schiemann, 1978). Supportive supervisory relationships have also been associated with employees' health benefits and psychological well being in other worker groups (Hayes & Feinleib, 1980; Matthews, Cottington, Talbott, Kuller, & Siegel, 1987; Sutherlund & Cooper, 1988). Evidence of the potentially negative consequences of suboptimal leadership behavior comes from two studies of plant employees (Bigos, Battie, Spengler, Fisher, Fordyce, Hansson, Nachemson, & Wortley, 1991; Leino & Magni, 1993). Both studies showed a prospective association between increased psychological distress and job dissatisfaction related to poor supervisory relationships. Both Kagay (1988) and Miller (1988) identified poor supervision as a major source of stress in the work environment.

Promotion to leadership positions within fire departments has historically been based on experience and seniority. However, prior research has shown that the overall correlation between experience and leadership perfor-

mance in fire service employees and other occupational samples is near zero (Fiedler, 1970; Frost, 1980; Fiedler & Garcia, 1987). Fiedler, Frost, and Swartout (1981) investigated the contribution of "years of experience" in the fire service under both low and high stress conditions and found that years of experience correlated significantly with leadership performance under high perceived stress conditions and negatively under low stress conditions.

Leadership Training

Leadership training is a widespread method for preparing individuals to manage group members effectively. While the number of leadership training programs is considerable, there has been little rigorous research in evaluating training outcomes. Bass (1990) reported that only a few of the methods of leadership and management training were shown to be "typically effective" using scientific outcome evaluations. Bass (1990) noted that Leader Match training, developed by Fiedler and his associates, was an exemplar of a leadership training program that had been systematically evaluated for more than a decade. The validity and generalizability of this Leader Match training has been well-documented (Fiedler & Mahar, 1979; Fiedler & Chemers, 1984; Ayman & Chemers, 1991). A meta-analysis of 70 different management training studies conducted by Burke and Day (1986) concluded that only a few existing management training programs (including Leader Match) were based on credible measures of organizational performance. Beneficial outcomes previously documented for Leader Match training have included employees' reduced injury rates, increased job satisfaction, improved leaders' performance, enhanced decision-making, and decreased absenteeism (Fiedler & Mahar, 1979; Fiedler, Bell, Chemers, & Patrick, 1984; Ayman & Chemers, 1991).

Stress Management Training

Inordinate or frequent exposures to occupational stressors can also have a dramatic effect on organizational effectiveness. Previous research has documented a variety of occupational stressors in firefighters including job demands, role characteristics, policies and procedures, boss stress, subordinate stress, and inadequate resources to perform their duties (Beaton & Murphy, 1993). Acute and chronic reactions to these occupational stressors can be manifested in a variety of ways including behavioral (absenteeism, accidents, and injuries), physiological (increased blood pressure, muscle tension), and psychological (distress, poor decision-making). No published studies of work-site stress interventions for professional firefighters were identified in a published meta-analytic review (Murphy, 1996). The present intervention study included a two-hour tailored cognitive behavioral stress-management training component and a one-hour "humane management in the fire service" interactive video module. These stress management training

module(s) focused on the identification of occupational sources of stress, the participant's own stress-related adverse health outcomes, specific coping strategies as well as a demonstration of "humane" management techniques for fire service supervisors dealing with their subordinates.

Research Hypotheses

Four specific research hypotheses were examined in this investigation.

H_1: The rates of on-the-job injuries, absenteeism, and noninjurious apparatus (mostly fire department vehicles) incident rates are lower after the leadership-stress management training intervention compared to pretest baseline(s) in the treated experimental (E) department and relatively stable in comparable fire service personnel in the control (C) urban fire department.

H_2: Ratings of supervisory behavior, job satisfaction, coworker conflict, and perceived ability to attain career goals are improved in the experimental department in both the line firefighters (E_f) and first-line supervisors (E_s) after the leadership intervention compared to pretreatment baseline(s) and remain relatively stable in comparable fire service personnel in the "control" urban fire department's line firefighters (C_f) and first-line supervisors (C_s).

H_3: Ratings of sources of occupational stress, including perceived conflict between management and labor, are lower in both the line firefighters (E_f) and first-line supervisors (E_s) in the treated experimental department following the leadership intervention and remain relatively stable in comparable fire service personnel in the "control" urban fire department's line firefighters (C_f) and first-line supervisors (C_s).

H_4: Self-reported stress symptoms, including posttraumatic stress symptoms, are lower after the leadership intervention in both line firefighters (E_f) and first-line supervisors (E_s) in the "treated" department and remain relatively stable in comparable fire service personnel in the "control" urban fire department's line firefighters (C_f) and first-line supervisors (C_s).

Method

Design

The study employed a quasi-experimental repeated-measures time-series design with a pretreatment baseline and two follow-ups at 3 and 9 mo. postintervention. All baseline pretreatment survey measures were obtained from the firefighters (E_f) and their first-line supervisors (E_s) in the "treated" department 3 mo. prior to the intervention. Comparable data collected at the same time were also available from a nonequivalent untreated "control" department located in another county within the same state from both firefighters (C_f) and their first-line supervisors (C_s). All study participants in both the "treated" and "control" fire departments were rewarded a nominal monetary sum ($10–$15) for completing and returning surveys. Objective in-

dices monitored both one year prior to and nine months following the intervention in both the "control" and "treated" fire departments included line of duty injury rates, absenteeism, and apparatus incidents (mostly vehicular accidents which did not involve injury). The untreated control fire department sample(s) (C_f and C_s) served as the comparison group(s) on all indicators and controlled for historical and test-taking reactivity effects (Campbell & Stanley, 1966). The nonequivalent control group, time-series design employed using Campbell and Stanley (1966) notation was as follows:

OBSERVATIONAL STRUCTURE

Group	Baseline	Intervention	Follow-up	
			3-mo.	9-mo.
Treated	O_1	X	0_2	0_3
Control	O_1		0_2	0_3

In the "treated" or experimental department, outcomes for both the line firefighters (E_f) and first-line supervisors (E_s) groups were available for separate analysis and comparison(s) with the control department line firefighter (C_f) and first-line supervisor (C_s) groups. To deal adequately with the number of subjects lost due to attrition and missing data, a median imputation data analytic technique was employed. A median imputation procedure was utilized because studies have demonstrated that the grand mean may not be the most appropriate procedure for handling missing data (Kromrey & Hines, 1994; Hegamin-Younger & Forsyth, 1998) while the median substitution or imputation technique is considered more robust to outliers.

Samples

The experimental group (E) consisted of line firefighters (E_f; $n=51$) and their immediate supervisors (E_s; $n=8$). Attrition reduced these samples at 3- and 9-mo. postintervention data collection to 44 and 31 in E_f, and to 7 and 6 in E_s, respectively. Nonequivalent "control" samples consisted of firefighters (C_f; $n=166$) and first-line supervisors (C_s; $n=43$) from a similar "untreated" urban fire department.

Intervention Protocol

The intervention consisted of a Leader Match training and two additional stress-management modules offered to the supervisors of the experimental department. The supervisors in the experimental group included all fire department personnel with a rank of Captain or above. The total number of intervention participants ($n=40$) represented 90% of the eligible personnel. The 8-hr. training intervention designed specifically for fire service officers was taught to groups of 8 to 12 fire department supervisory personnel by the senior author. The intervention consisted of three training modules.

(1) The *Leader Match training* was based on The Contingency Model for leadership effectiveness (Fiedler, 1967) and consisted of five hours of information, self-evaluation, and quizzes which focused on four areas: (a) assessing and matching participant leadership styles to specific leader situations in the fire service, (b) ways to diagnose officer leadership situations, (c) how to change critical elements of leadership situations to match leadership style, and (d) how to apply or match leadership styles to specific leadership situations.

(2) *A two-hour psycho-educational cognitive-behavioral stress-management component* targeted specific sources of stress among the participating fire service personnel and included rehearsal of various cognitive-behavioral stress-reduction techniques (Lehrer & Woolfolk, 1993).

(3) *A one-hour video tape and discussion of examples of humane approaches to management in the fire service*, which provided a model for dealing with subordinates in various scenarios including "disciplining an employee," "dealing with an irate employee," and "reinforcing correct behavior" (Fiedler, 1981).

Measures

All of the surveys described below have been used in previous investigations to measure job-related stressors and stress-related symptomatology in firefighters and paramedics.

(1) *Sources of Occupational Stress (SOOS).*—This 57-item scale was designed to measure the psychosocial stressors to which firefighters and paramedics are commonly exposed. The respondents were asked to indicate whether they have experienced a particular type of occupational stressor within their past 10 work shifts and, if they have, to indicate how "bothered" they were on a 0–100 visual analog scale (or VAS) for which anchors were 100: extremely bothered, 50: somewhat bothered, and 0: not bothered at all. Summating their replies to all 57 items (with not applicable = 0) yielded a total SOOS score. Prior research with firefighters has documented that the scale consists of 14 statistically distinct factors. The overall Cronbach alpha was .95 (Beaton & Murphy, 1993). The total SOOS score reported by a sample of urban firefighters correlated strongly ($r = .60$) with the number and frequency of stress symptom complaints as measured by the Symptoms of Stress Inventory (Beaton, *et al.*, 1995).

(2) *Job Satisfaction and Ability to Attain Career Goals.*—Two separate items were employed to assess job satisfaction and career goal perceptions. One outcome measure asked fire service respondents to rate their current overall job satisfaction rating on a 0–100 VAS for which anchors were 0: not satisfied at all with job and 100: completely satisfied with job. Another measure asked for their appraisal of their ability to attain their career goals with

ratings on a 0–100 VAS. Here, anchors were 0: completely unable to obtain career goals and 100: career goals completely attainable. Prior research with firefighters had documented that job dissatisfaction was associated with perceptions of high occupational stress (Beaton, Murphy, Pike, & Corneil, 1997). The measure of job satisfaction employed appeared to be relatively stable, with a test-retest reliability ($r = .63$) over a 6-mo. interval obtained from another convenience sample of firefighters ($n = 177$).

(3) The *Symptoms of Stress Inventory* (SOS) was used to measure the firefighter/paramedic respondent samples' somatic, behavioral, and psychological symptomatology. Firefighter and paramedic respondents were instructed to rate the frequency with which they may have experienced a particular stress symptom during the past week on a 0- to 4-point scale with anchors of 0: never and 4: frequently. There are a total score as well as 11 content-derived subscale scores. Prior research has shown that this inventory has adequate Cronbach α of .96, and that the test-retest reliabilities for the scales in a stressed client sample ranged from .47 to .86 over a 6-wk. delay of treatment test-retest interval (Nakagawa-Kogan & Betrus, 1984; Beaton, *et al.*, 1995). Several scales of the inventory have also differentiated between samples of healthy and stressed clients (Beaton, Egan, Nakagawa-Kogan, & Morrison, 1991).

(4) The *Impact of Event Scale* was used to assess the presence and self-reported frequency of posttrauma symptomatology (Horowitz, Wilner, & Alvarez, 1979). This scale is a 15-item measure of posttrauma symptomatology that yields a total score as well as scores on Intrusive and Avoidance subscales. The IES total score shows adequate reliability ($r = .87$) (Zilberg, Weiss, & Horowitz, 1982) and has been used to assess posttrauma symptomatology in a variety of trauma-exposed samples including career and volunteer firefighters (McFarlane & Alexander, 1989; Corneil, *et al.*, 1999).

(5) *Ratings of Supervisory Behavior* is a 16-item measure of supervisory behavior, adapted for use with the fire service personnel and was designed to assess workers' perceptions of the extent of open communication and positive, supportive interactions between supervisors and subordinate personnel. This measure's scales have been shown to have good reliability and validity in previous studies of emergency medical technicians (EMTs) (Revicki, Whitley, Landis, & Allison, 1988; Revicki, May, & Whitley, 1991). Internal reliabilities and consistency in their EMT sample was .82 for work group function, .78 for role clarity, and .96 for supervisor behavior scales (Revicki, *et al.*, 1991). In a validation study, EMTs who reported open and supportive supervision on the Supervisory Behavior Rating Scale subsequently reported lower distress (Revicki & Gershon, 1996).

(6) *Records of on-the-job injury,* departmental noninjurious apparatus incidents, and absenteeism rates were maintained by both the intervention

and control fire departments on each global index and were examined separately for the prior 1-yr. and subsequent 9-mo. periods following the intervention in both fire departments.

Results

Sample Demographics at Baseline and Preintervention Equivalence

The experimental first-line supervisors (E_s; $n=8$) who completed surveys at baseline were all men whose mean age was 44 yr. The E_s sample's average number of years of formal education was 15, and their mean length of service as a firefighter was 18 yr. Comparison of the E_s subjects who completed surveys at baseline with the samples who provided survey data at the first ($n=7$; 1 dropout) and second postintervention period ($n=6$; 2 dropouts) showed no significant differences between these completer groups on these demographic measures.

The mean age of the experimental line firefighter sample (E_f; $n=51$) was 36 yr. They had an average of 14 yr. of formal education and a mean of 5 yr. of service as firefighters. Comparisons of the E_f sample who completed surveys at baseline with the samples who subsequently completed surveys at the first ($n=44$) and the second ($n=31$) postintervention periods showed no significant differences between these completer groups on demographic variables.

The untreated control firefighter sample consisted of 166 firefighters (C_f) and 43 first-line supervisors (C_s) from another urban fire department in another county within the same state. The C_f and C_s samples were comprised of men. The mean age for the "control" supervisory sample (C_s) was 41 yr., with a reported 14 yr. of formal education and a mean of 16 yr. in the fire service. The mean age of the "control" firefighter (C_f) sample was 36 yr., and their average years of education was 14 plus an average of 9 yr. of service. Comparisons of the experimental and control departments' first-line supervisors and firefighter samples (E_f vs C_f and E_s vs C_s) on selected demographic variables are shown in Tables 1 and 2. To counter the possible bias due to attrition, all subjects in the control fire department's line firefighter and first-line supervisor samples for whom baseline data were available were included in all subsequent analyses via the median substitution on data-imputation technique.

Analyses of variance and t tests for continuous variables and chi squared tests for categorical variables were generated to test for differences at baseline between the experimental and the control group samples. Tables 1 and 2 present results of these analyses and descriptive statistics for the demographic variables in the experimental and control departments for both the line firefighter (E_f and C_f) and first-line supervisor (E_s and C_s) samples at baseline. A comparison of experimental and control participants in both

TABLE 1
UNIVARIATE ANALYSES AND DESCRIPTIVE STATISTICS FOR BASELINE DEMOGRAPHIC VARIABLES COMPARING FIRST LINE SUPERVISOR SAMPLES IN EXPERIMENTAL INTERVENTION AND CONTROL GROUP FIRE DEPARTMENTS

Variable	Experimental Department Supervisors (E_s) ($n=8$)				Control Department Supervisors (C_s) ($n=43$)				t_{49}*
	M	*SD*	*Mdn*	Range	*M*	*SD*	*Mdn*	Range	
Age, yr.	43.8	5.5	46	33–51	41.0	6.5	41	26–52	1.19
Education, yr.	15.0	1.9	16	12–17	14.0	1.3	14	12–16	2.60
Firefighter, yr.	17.7	6.8	18	5–28	15.8	6.2	15	1–29	.81
Race, %									χ_3^2
Caucasian	88				88				
African American	0				0				
Hispanic	0				2				
Other	12				10				.24

* t ratios are ns.

the firefighter and first-line supervisor samples showed significant differences between the two departments' personnel on some of the key demographic variables. In the supervisor samples, average years of education differed significantly between the E_s and C_s groups ($t_{49}=2.60$, $p<.05$), but none of the correlations between years of education and any of the outcome measures were statistically significant. Since none of the demographic variables in the first-line supervisor samples were significantly correlated with the outcome

TABLE 2
UNIVARIATE ANALYSES AND DESCRIPTIVE STATISTICS FOR BASELINE DEMOGRAPHIC VARIABLES COMPARING EXPERIMENTAL INTERVENTION AND CONTROL GROUP FIRE DEPARTMENT FIREFIGHTER SAMPLES BEFORE MATCHING

Variable	Experimental Department Firefighters (E_f) ($n=55$)				Control Department Firefighters (C_f) ($n=166$)				t_{49}*
	M	*SD*	*Mdn*	Range	*M*	*SD*	*Mdn*	Range	
Age, yr.	32.2	6.6	31	23–50	36.4	7.3	36	22–53	3.62‡
Education, yr.	14.4	1.7	14	12–18	14.0	1.6	14	12–18	1.40
Firefighter, *M* yr.	5.3	6.6	2.5	.5–28	8.6	7.8	6	0–26	2.71†
Race, %									χ_3^2
Caucasian	94				87				
African American	2				5				
Hispanic	2				1				
Other	2				7				4.49

†$p<.01$. ‡$p<.001$.

variables, no matching procedure was implemented. The line firefighter samples showed statistically significant differences between E_f and C_f for age and reported number of years of service ($t_{49}=3.62$, $p<.01$ and $t_{49}=2.71$, $p<.01$, respectively). Further investigation with correlations indicated that the

number of years of service correlated significantly with some of the key outcome variables in the line firefighter samples (E_f and C_f). Therefore, to eliminate these group differences, a two-to-one matching (two subjects from the

TABLE 3
UNIVARIATE ANALYSES AND DESCRIPTIVE STATISTICS FOR SELECTED EVALUATION MEASURES COMPARING FIRST-LINE SUPERVISOR EXPERIMENTAL (E_s) AND CONTROL GROUP SUPERVISOR (C_s) SAMPLES AT BASELINE

Variable	Experimental Supervisor Sample (E_s) ($n=8$)		Control Supervisor Sample (C_s) ($n=43$)		t_{49}[b]
	M	*SD*	*M*	*SD*	
Supervisory Ratings[a]	44.70	16.10	40.20	11.20	.96
Peripheral Symptoms	.77	.54	.63	.61	.56
Gastrointestinal Symptoms	.80	.82	.81	.66	.02
Total Impact of Events Score	13.70	14.70	13.00	15.10	.12

[a] Lower scores indicate greater satisfaction with immediate supervisor. [b] All associated *p* values are ns.

the "control" group were matched with each subject in the experimental group) was generated, using years of service as the key matching variable. Follow-up analyses on these matched groups yielded no significant differences on the age or "years of service" variables. Tables 3 and 4 show the baseline comparisons between these same samples against which there were no significant differences on any of these measures. All subsequent analyses with the line firefighter samples employed this matched control group sample.

TABLE 4
UNIVARIATE ANALYSES AND DESCRIPTIVE STATISTICS FOR SELECTED EVALUATION MEASURES COMPARING FIREFIGHTER EXPERIMENTAL (E_f) AND CONTROL GROUP FIREFIGHTER (C_f) SAMPLES AT BASELINE AFTER MATCHING PROCEDURE

Variable	Experimental Firefighter Sample (E_f) ($n=51$)		Control Firefighter Sample (C_f) ($n=102$)		t_{151}
	M	*SD*	*M*	*SD*	
Supervisory Ratings[a]	35.9	8.1	33.1	9.2	1.75
Ability to Attain Career Goals	63.1	24.3	69.5	19.0	1.72
Recollections of Past Critical Incidents	16.8	15.6	12.8	14.2	1.60

[a] Lower scores indicate greater satisfaction with immediate supervisor.

Time by Department Analyses: Evaluation Outcomes

Analyses comparing the experimental supervisors ($n=8$) and the control supervisors ($n=43$) in terms of supervisory ratings, using a median imputation method for estimating missing data at the 3- and 9-mo. postintervention follow-ups, yielded a significant quadratic effect ($F_{2,48}=5.97$, $p<.05$). The ex-

perimental department personnel reported initial improvements on the supervisory rating measure at the 3-mo. follow-up but a return to baseline levels at the 9-mo. postintervention evaluation on this same measure (see Table 5). The control department showed no significant temporal changes on the supervisory rating scale. The repeated-measures analyses (Table 5) also gave a significant linear trend over time in the treated experimental department, documenting decreased self-reports of gastrointestinal symptoms ($F_{2,48} = 6.57$, $p < .05$) and fewer peripheral symptoms of stress ($F_{2,48} = 7.38$, $p < .01$).

TABLE 5

ANALYSES OF TIME BY DEPARTMENT INTERACTIONS AND DESCRIPTIVE STATISTICS FOR THREE- AND NINE-MONTH OUTCOMES COMPARING EXPERIMENTAL (E) WITH CONTROL AND MATCHED CONTROL (C) DEPARTMENTS' FIRST-LINE SUPERVISOR AND FIREFIGHTER SAMPLES

		Supervisory Ratings[a]	Peripheral Symptoms	Gastrointestinal Symptoms
Experimental Department Supervisors (E_s) ($n = 8$)				
Pretest	*M*	44.7	.77	.80
	SD	16.1	.54	.82
Posttest 1	*M*	34.6	.42	.61
	SD	9.4	.35	.63
Posttest 2	*M*	39.2	.07	.19
	SD	9.6	.13	.28
Control Department Supervisors (C_s) ($n = 43$)				
Pretest	*M*	40.2	.63	.81
	SD	11.2	.61	.66
Posttest 1	*M*	37.8	.55	.66
	SD	10.2	.51	.10
Posttest 2	*M*	36.0	.53	.78
	SD	12.3	.45	.56
$F_{2,148}$[a]		5.97*	7.38†	6.57*
		Supervisory Ratings[b]	Ability to Attain Career Goals	Recollections of Past Critical Incidents
Experimental Department Firefighters (E_f) ($n = 51$)				
Pretest	*M*	35.0	63.1	16.8
	SD	8.1	24.3	15.6
Posttest 1	*M*	32.4	69.4	12.8
	SD	8.9	15.8	11.9
Posttest 2	*M*	33.1	69.5	11.2
	SD	9.2	19.0	13.2
Control Department Matched Firefighters (C_f) ($n = 101$)				
Pretest	*M*	33.1	69.5	12.8
	SD	9.2	19.0	14.2
Posttest 1	*M*	32.6	69.3	11.3
	SD	10.0	17.0	15.7
Posttest 2	*M*	32.9	68.9	13.2
	SD	10.2	8.5	16.3
$F_{2,149}$[a]		3.95*	8.52†	6.04*

[a] *F* ratios and *p*s reflect Time by Department Interactions. [b] Lower scores indicate greater satisfaction with immediate supervisors. *$p < .05$. †$p < .01$.

Repeated testing with analysis of variance at the 3- and 9-mo. follow-ups, comparing the supervisory ratings for the firefighter intervention sample ($n=51$) and the matched firefighter control group ($n=102$), also gave a significant quadratic effect ($F_{2,149}=3.95$, $p<05$). The experimental firefighter sample reported initial improvements on the supervisory rating measure at the 3-mo. follow-up, but there was a return to pretreatment baseline levels at the 9-mo. follow-up on this measure (see Table 5 and Fig. 1). As shown in Table 6, additional analyses also yielded a significant linear trend for the experimental firefighter sample, documenting decreased self-reports of recollections of past critical incidents ($F_{2,149}=6.04$, $p<.05$) and improved perceptions of ability to attain their career goals ($F_{2,149}=75.82$, $p<.01$). These changes were sustained at the 9-mo. postintervention follow-up. The control departments' scores on virtually all of the measured variables, with one exception, did not change significantly between baseline and the 9-mo. follow-up. The only measure on which the control department changed significantly from their baseline score was on the measure of Recollections of Past Critical Incidents, a Sources of Occupational Stress subscale.

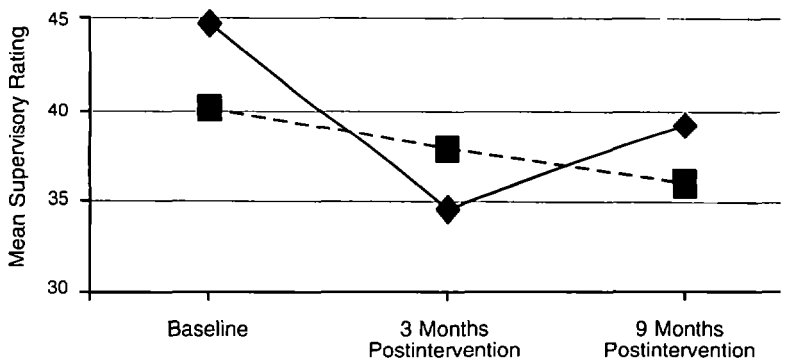

FIG. 1. Mean supervisory ratings for firefighter sample comparing intervention (◆, $n=51$) and control (■, $n=101$) firefighter groups at baseline, 3 mo., and 9 mo postintervention (matched sample). Lower scores indicate greater satisfaction with immediate supervisors.

There were no significant changes in either the intervention or control departments in terms of work days lost due to injuries or illness or any other objective departmental index during the 9-mo. postintervention time frame. Finally, there was no significant intervention-related change on the job-satisfaction measure in either the supervisor or firefighter samples.

DISCUSSION

The purpose of this investigation was to assess whether a single, relatively brief intervention of 8 hours of training for a fire department's supervisors could produce beneficial outcomes. A related purpose was to docu-

ment the nature and longevity of any beneficial outcomes for both the first-line fire supervisors and their firefighter subordinates.

The hypothesis (H_2) with regard to leadership ratings, ability to attain career goals, and coworker conflict was partially supported in the line firefighter sample at 3 mo. postintervention. However, at the 9-mo. postintervention follow-up, only improvements in firefighter "appraisals to attain their career goals" were still significantly elevated relative to their baseline. Hypotheses which predicted lower ratings on measures of sources of occupational stress and stress symptomatology following the stress-management or the Leader Match intervention in the experimental department compared to pretest baseline(s) were partially supported. Hypothesis 1 (lower rates of on-the-job injuries, absenteeism, and apparatus incidents following the stress management or leader match intervention) was not supported.

This brief one-day leader match training and stress management intervention was associated with specific short-term (3 mo. postintervention) improvements in supervisory ratings in both the experimental line firefighter and first-line supervisor samples (E_f and E_s). However, these improvements in supervisory ratings in the experimental department were apparently short-lived and not maintained at the 9-mo. follow-up. Although these gains were temporary, reports of the experimental firefighter's (E_f) appraisal of their ability to attain their career goals was observed to persist for a least nine months following the intervention. There were no time-related changes on the control fire department's supervisory behavior ratings.

The results of this study were similar to those of another previously conducted study with another urban fire department (Frost, 1986). Results from this study of 96 fire service officers also showed no statistically significant improvements in supervisory ratings (given by their supervisors) of officers' job performance measured at 8 mo. following a single 7-hr. Leader Match intervention. Frost (1986) concluded that the effects from this leadership training in this worker sample were possibly temporary and diminished as the novelty wore off. Frost (1986) further suggested that a Leader Match training program may work best with leaders who are new to their positions or when the work groups are relatively flexible and receptive to change.

While there were no significant decreases in stress symptomatology in the firefighter sample, there were statistically significant decreases in gastrointestinal and peripheral (cutaneous) stress-related symptoms in the experimental supervisory (E_s) sample. While the changes in the experimental line firefighters (E_f) appeared to be primarily perceptual and cognitive, including decreases in posttraumatic imagery, the stress symptom reductions in the first-line supervisors (E_s) may have been related to the intervention format. The latter provided "hands-on" stress management training for the first-line supervisors but not for the line firefighters. Prior research with Leader Match

training and stress-management interventions with other worker groups have identified a number of beneficial outcomes for employees, but most of the previous outcome investigations, with some notable exceptions, have not included long-term follow-ups nor objective indices (Fiedler & Chemers, 1984; Fiedler, *et al.*, 1984; Murphy, 1996).

Suggestions for Research

A potential confounding and uncontrolled variable in the present field study was some ongoing management-labor strife in the experimental or "treated" department, including protracted contract negotiations, which possibly contributed to increased variability on certain measures of distress. Quasi-experimental designs, while they include some types of control, are not impervious to these and other types of threats to internal validity (Campbell & Stanley, 1966). One major difficulty with the present "control" department was that it was not initially equivalent to the "experimental" department on several of the demographic variables assessed. The experimental and control department supervisor samples differed significantly from each other on years of education. The firefighter samples differed from one another in average age and years of service as firefighters. The control department may also have differed from the experimental department in ways that obscured the effects of treatment. Potentially there may also have been other unmeasured organizational or maturational changes occurring in this comparison group. Likewise, the selection bias may also have been operating at the intradepartmental level since the survey respondents represented about 50 to 70% of the potential respondents from the experimental and control departments, respectively.

The present research employed a two-group (intervention and control) time-series quasi-experimental design and employed multiple methods of "triangulation" (Hurrell, Nelson, & Simmons, 1998). Although this design partially mitigates threats to the internal validity of the investigation, it is difficult to generalize these findings to other fire service organizations. Importantly, the findings of this study do not rule out the possibility of an interaction with other types of ongoing training programs and how often (and how intensive) such training would need to occur to produce and sustain both subjective and objective benefits.

It is also possible that a multicomponent intervention may have diluted or detracted from the effects of the Leader Match training which has generally been shown to produce more robust and sustained benefits with most worker groups. Identification of the specific training components associated with improvements or subsequent loss of these improvements in subordinates' ratings of leader behavior or on other indicators were not possible to isolate in this investigation. In addition, more research is needed to address

the organizational changes which could lead to sustained improvements. Such sustained improvements might eventually lead to long-term health improvements, including cost-effective declines in injury rates and decreased absenteeism, in high-risk occupations such as urban fire service personnel. Finally, the limitations inherent in the small number of subjects involved in this investigation, and especially in the first-line supervisory samples, are acknowledged.

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