

Wellness Programs at Firefighter and Police Workplaces: A Systematic Review

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Objectives: This systematic review summarizes the literature on the health effects of wellness programs at police and firefighter workplaces. The review also considers process outcomes and economic evaluations of such programs. **Methods:** A systematic search of articles published from January 1, 2000 through September 1, 2012 in 13 databases was conducted. Data on 7 studies from 9 articles were extracted. An assessment of the methodological quality of the studies was conducted. **Results:** Studies showed acceptable completion rates and high satisfaction with programs, but mixed results for changes in individual outcomes. **Conclusion:** Empirical evidence for effective health and wellness programs in police and firefighter populations is scarce. Better evaluation and documentation of such programs is needed to advance this field of research.

Key words: occupational health services, quantitative evaluation, systematic review, wellness programs, workplace
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As first responders, police officers and firefighters are exposed to a wide variety of stressors, rendering these occupations as some of the most challenging ones.^{1,2} Police officers encounter physical stress from walking, climbing stairs, manipulating objects, twisting/turning, pulling/pushing, running, bending, squatting and kneeling, and lifting and carrying, with many of these involved in the physical apprehension of suspects.³ Likewise, firefighting is characterized by physiological stressors, such as carrying and operating tools and equipment, placing and climbing ladders, pulling and advancing hoses, climbing stairs, wrestling hose streams, pushing and pulling ceilings and walls, and potentially dragging victims.⁴ Such activities have led to exertion-related incidents that have resulted in heart attacks and sudden cardiac arrest while on duty.⁵

Compared with the general population, police officers are at an elevated risk for adverse mental and physical health outcomes, including increased blood pressure, smoking, and likelihood of subclinical arteriosclerosis.⁶ When compared to the gen-

eral population, firefighters are at an increased risk of obesity, low levels of high density lipoproteins, high levels of low density lipoproteins, and high levels of total cholesterol.⁷ Given the types of physical stress encountered by police and firefighters, these civil servants are in need of workplace health and wellness programs that are tailored to their unique organizational and occupational needs.

Workplace health and wellness programs have tended to emphasize physical wellness, and typically comprise cardiovascular fitness, education for chronic disease prevention, nutrition advice, weight management, musculoskeletal conditioning, and stress management.⁸ Evidence suggests that such programs may have considerable health benefits for workers.⁹ The effectiveness of workplace health and wellness programs developed for police and firefighters, however, is largely unknown. The primary aim of this review is to evaluate the evidence from health and wellness programs at the workplaces of police officers and firefighters aimed to improve the health outcomes of these employees. The review also considers all process and economic evalu-

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ations reported. The information gained from this literature review can guide future research into the effectiveness of workplace health and wellness for police and firefighter occupations.

METHODS

Search Strategy and Selection

Studies were identified through a database search of English-language peer-reviewed journal articles and theses/dissertations published between January 1, 2000, and September 1, 2012, to capture programs most relevant to current practice. Given the diversity of databases in which health and wellness programs can be located, an extensive list of databases was searched. Databases included ERIC, Published International Literature on Traumatic Stress (PILOTS), ProQuest Criminal Justice, ProQuest Health and Medical Complete, ProQuest Nursing and Allied Health Source, ProQuest Psychology Journals, ProQuest Dissertations and Thesis (PQDT), CINAHL, Criminal Justice Abstracts, MEDLINE, Military and Government Collection, PsycINFO and SPORTDiscus.

For inclusion in the review, an article had to describe the evaluation of a primary prevention health and wellness program for a firefighter or policing workplace. Much of the literature in the target populations describes programs implemented in response to critical incidents (disasters, traumatic events or other emergencies), and these were excluded. Given the emergence of health and wellness programs in the target population, pre-test/post-test, quasi-experimental and experimental designs were included and criteria for inclusion were left broad. Articles were excluded that were non-English language, articles published before 2000, opinion and theory articles, reviews, and articles without a program evaluation described.

To retrieve articles meeting the criteria, titles and abstracts were initially searched using the terms: (wellness or health) and (police or law enforcement or fire*) and (initiative or program* or intervention or worksite or workplace). The "*" was added to the end of words to recognize variations of that word.

The review process started with a title review. Titles of the retrieved articles were reviewed to determine which ones clearly did not meet study eligibility. A sub-sample of 10% of the retrieved

article titles were reviewed independently. For the sub-sample, 2 investigators discussed disagreements concerning the articles selected for removal and retention, eventually reaching consensus. Remaining articles were removed from further consideration if they did not meet study eligibility.

A review of the abstracts of all articles that qualified for further evaluation was conducted. As with the title review, a 10% sub-sample of the abstracts was examined independently by a second reviewer. For the sub-sample, the 2 investigators discussed any disagreements in the articles selected for further review and came to consensus on those to include in a full text review. The remaining abstracts were reviewed by one of the investigators to determine ones to be considered in a full text review.

One investigator then conducted the full text review. Again, a second investigator independently reviewed 10% of studies, and the 2 investigators discussed any disagreements in their conclusions as to which studies should be included in the literature review. Where disagreement occurred, discussion ensued until consensus was achieved. One investigator then reviewed the full text of the remaining articles to determine their eligibility. Last, one investigator manually searched the reference lists of articles eligible for the literature review, to assess if any had the potential to meet the inclusion criteria, and thus, should be reviewed as well. One investigator reviewed abstracts and, as required, the full text of such articles. Where multiple publications for the same study existed, relevant data were extracted from all articles. Two investigators reviewed the final list of articles to include in this systematic review and removed articles that did not describe evaluations.

Data Extraction and Management

One investigator abstracted relevant program and study characteristics from the included articles. Study characteristics included authors, publication year, sample details (number of participants, sex distribution, and occupations), study groups, study length, and study design. Program details included the program components, purpose and hypothesized outcomes. Extracted outcome data included process data (eg, completion rates), economic outcomes of relevance to a workplace program (eg, cost-effectiveness, health care utilization), and in-

dividual health outcomes, including changes in health status, behavior, and behavioral correlates. Two investigators reviewed all extractions for completeness and accuracy. Any relevant missing information was sought from the primary author of the study.

Two investigators assessed the quality of the studies using the Effective Public Health Practice Project's Quality Assessment Tool for Quantitative Studies.¹⁰ Ratings between investigators were completed jointly and all discrepancies were resolved via consensus. Studies were rated as "weak," "moderate," or "strong" on each of 6 components: (1) selection bias (whether participants were likely to be representative of the target population and the percentage of that population that agreed to participate); (2) study design (type of design, randomization procedures); (3) confounders (differences between groups prior to the program and whether these confounders were controlled); (4) blinding (evaluators' awareness of group assignment or exposure status of participants' and participants' awareness of research questions); (5) data collection methods (validity and reliability of data collection methods); and (6) withdrawals and dropouts (reported numbers and reasons for these reported for each group, and study completion rates). Studies were then assigned a global rating of "weak" (2 or more weak ratings), "moderate" (one weak rating) or "strong" (no weak ratings).¹¹

RESULTS

The database searches identified 1712 articles after duplicate articles were removed (Figure 1). Upon review of their titles and abstracts, 1624 were excluded as they did not meet eligibility criteria. The remaining 88 articles were examined in full. Another 80 articles were excluded because they did not meet the eligibility criteria. One eligible article was included from the manual review of article reference lists, resulting in 9 articles describing 7 separate studies being included in the review.

Study Samples

As Table 1 shows, 3 included studies recruited participants from policing workplaces,¹²⁻¹⁴ whereas 4 studies recruited participants from firefighter workplaces.¹⁵⁻²⁰ Six studies included only police officers or firefighters,^{12,14-20} and one included civilian

staff.¹³ Across studies that reported sex of participants, most participants (>78%) were men. All studies were conducted in the United States. Whereas one study was a small pilot comprised of 33 firefighters,¹⁶ others were larger studies with over 100 participants.^{12-15,17-20} The 2 largest studies included 599 firefighters^{15,17,20} and 252 firefighters respectively.¹⁹

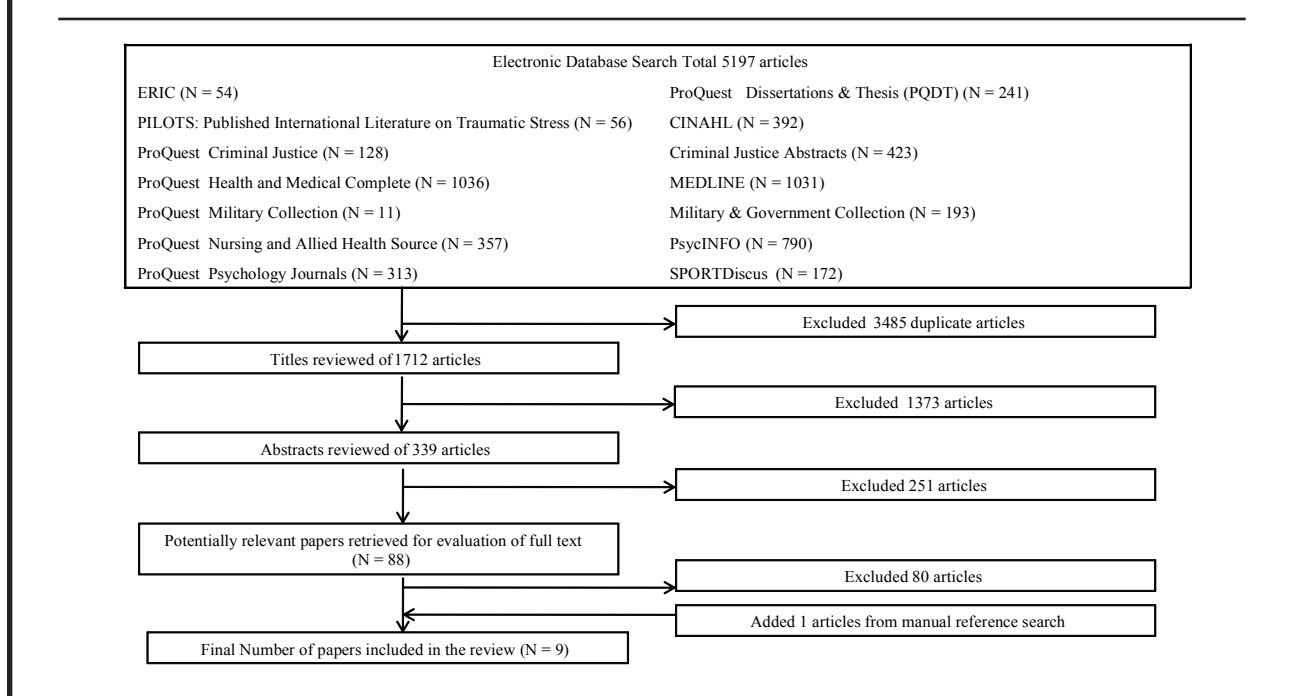
Program Purposes, Descriptions, and Length

The main aims of the included programs were to improve health,^{12-16,18} with specific aims to improve fitness,^{12,14,18,19} reduce injury,¹⁹ improve diet and physical activity practices,^{12,15,16} and improve percent of body fat.¹⁴⁻¹⁶ To meet these aims, the main components of the programs were seminars,^{12,18} individual wellness coaching and health education sessions,^{12,13,15,16,19} classroom sessions,^{15,16} individual supervised exercise sessions,¹² group supervised exercise sessions,^{14,18} and health assessments.^{13,15,16,19} Programs ranged in duration from 10 weeks to 4 years.^{12,19}

Of the programs completed in policing workplaces, one offered police a 3-hour seminar followed by 10 weeks of individual face-to-face and telephone-based coaching and weekly individual exercise sessions with performance coaches (graduate students serving as research assistants).¹² The second program, for all police officers, inspectors, and civilian personnel, offered a physical assessment followed by individual weekly or monthly counseling with a wellness coordinator over 4 months.¹³ Three modes of wellness counseling were compared (in-person, telephone, or email). The third program, for sedentary urban police officers, included supervised exercise sessions with aerobic exercise and strength training over 6 months, with encouragement to continue to exercise individually after the program.¹⁴

Of the programs for firefighters, a one-year program offered participants group-based circuit training sessions that included strength training and stretching exercises; separate aerobic endurance exercise training; and a presentation by an exercise physiologist to all cadets and new recruits (optional for incumbents) on the importance of healthy lifestyle and the impact of obesity on chronic disease risk.¹⁸ The second program, a 2-year program, included a medical, physical, and fitness examina-

Figure 1
Summary of Results and Articles Excluded After Each Phase of Study Selection



tion, after which participants met with a physician contracted to the fire department for one-on-one health education sessions.¹⁹ In sessions, participants were encouraged to perform ≥ 30 minutes of cardiovascular exercise 4-5 times per week. Participants were given individualized plans for achieving this goal. Sessions also addressed diet, weight loss, fitness, and tobacco use as applicable. For follow up, participants received a letter providing results from the initial examination and additional health-related recommendations, including the need to control chronic conditions and follow up with a primary care physician to do so.

The final 2 studies in firefighter populations were a pilot study and a larger trial of the same program.^{15,16,17,20} In both studies, participants received results of a physical and dietary assessment. One intervention group received 4 one-on-one counseling sessions with follow-up contact negotiated with the participant. The second intervention group received team-based classroom sessions facilitated by a trained peer with team activities scheduled during weeks when the classroom sessions were not held. Participants in the 2 intervention groups also received a 160-page health and fitness guide

developed by the investigators. The pilot program lasted 6 months, and the main study had high intensive strategies in years 1 and 2, and low intensity strategies in years 3 and 4 (annual assessments, mailed written health risk appraisals, and access to a program website to help with interpreting the appraisal results).

Study Designs

Only 2 studies used a randomized controlled study design (RCT).^{15-17,20} An additional study used a quasi-experimental design,¹³ which allowed for comparisons among different groups (3 groups receiving different program modes were compared), although participants were not randomized into the groups. The remaining 4 studies used a one-group pre-test/post-test design,^{12,14,18,19} which only allowed for comparisons of data collected before and after the study among program completers.

Study Outcomes

Process data. The process data showed that all study authors reported at least one process measure. All included studies reported program com-

pletion rates, and these were generally high (Table 2). Four study authors reported program completion rates. Anshel and Kang¹² reported a 61% program completion rate; Elliot et al¹⁶ reported that 73% of classroom intervention participants attended at least 7 of 11 sessions; Rossomanno et al¹⁴ reported that participants completed over 98% of their prescribed exercise sessions; and Moe et al¹⁵ reported that 34% attended all of the team sessions. The authors of the other 3 studies reported study completions: Biebel¹³ reported that 78% of participants completed follow up surveys; Geril and Huijbregts¹⁸ reported that 48% of participants completed the follow-up fitness testing and 59% completed a follow-up survey; and Leffer and Grizzel¹⁹ reported that 100% of participants completed the follow-up assessment. The authors of 2 studies also reported recruitment success: Geril and Huijbregts¹⁸ reported that 81% of eligible firefighters completed the baseline fitness testing, and Leffer and Grizzel reported that 83% of eligible firefighters completed their baseline assessment.¹⁹ Costs of program components were described for 2 studies: Leffer and Grizzel¹⁹ reported that the health assessment incurred a cost of \$200 per participant, and Moe et al¹⁵ reported that curriculum materials (team leader manual, team members' workbooks, and associated materials) cost \$25 per participant. For 2 studies, data on participants' interactions with the program were gathered. Elliot et al¹⁶ found that participants assigned to receive individual counseling spent an average of 6 hours with the intervention curriculum and 12 hours with the counselor (including the counselor's time). Participants who were assigned to classroom sessions required an average of 9 hours with the intervention curriculum. Participants that Moe et al¹⁵ assigned to receive individual counseling averaged 4 interactions with the counselor.

Economic evaluation data. Only 2 studies included an economic evaluation (Table 2). In a single-group pre-test/post-test study of a fitness program for firefighters that consisted of strength training, stretching, and aerobic exercise, Geril and Huijbregts¹⁸ found that for the year of the program, days lost from sickness decreased by 41%; claims decreased by 19%; and costs decreased by 69%, compared with those seen the prior year. The authors calculated that the total potential savings of the program was \$349,084. Also using a single-

group pre-test/post-test study, Leffer and Grizzel¹⁹ found that mean annual injury rates decreased by 40% by the end of the first year and 60% by the end of the second year, with a program consisting of an examination and one-on-one education with a physician followed by receipt of a mailed letter with results of a medical, physical, and fitness examination and health-related recommendations. Additionally, the authors found large savings from having fewer injuries among workers and cost-effective return on investment (4.2:1 in year 1 and 4.6:1 in year 2).

Individual outcomes. Most outcomes reported were individual outcomes. Five studies tested for statistical significance of changes pretest to post-test (noted in Table 2 with a p-value).^{12,14-17,19,20} Two studies examined change over time but did not test for statistical significance.^{13,18}

Physical fitness. Seven studies examined changes in physical fitness of participants, with 4 of these finding improvements.^{12-16,18,19} Anshel and Kang¹² used individual face-to-face and phone-based performance coaching with motivational interviewing strategies to improve physical fitness significantly over 10 weeks ($p < .001$).¹² Biebel¹³ reported that 22% of participants in weekly or monthly contact with a wellness coordinator showed improvements of at least 20% on a composite measure of fitness over 4 months (although statistical significance was not tested). Geril and Huijbregts¹⁸ improved submaximal VO_2 by 8%, push-up repetitions by 15%, abdominal endurance by 32%, lower back/hamstring flexibility by 36%, and upper body strength by 20% through circuit training over one year (statistical significance not tested). Rossomanno et al¹⁴ used supervised job-specific moderate exercise sessions with aerobic exercise to improve cardiovascular and muscular fitness for job qualifications over one year ($p < .01$), and these results were again observed at an 18-month follow-up ($p < .01$). Moe et al¹⁵ and Elliot et al¹⁶ reported no improvements in peak VO_2 among participants receiving individual counseling or classroom sessions ($p > .05$) over 6 months and 12 months respectively. However, both intervention groups in the Moe et al¹⁵ study experienced improvements in abdominal endurance ($p < .05$). Leffer and Grizzel¹⁹ saw no change over 2 years in systolic or diastolic blood pressure ($p > .05$) after participant meetings with a physician who provided individualized plans.

Table 1
Description of Studies

Study	Sample	Program Purpose	Program Description	Program Length	Design
Anshel and Kang, 2008 ¹²	Unfit police officers N = 109 (of the 67 study completers, 81% male) United States	Improve fitness, nutrition, blood lipid profiles	I: 3-hr seminar with workbook, DVD, group member interaction, and lecture for development of exercise and nutrition action plan; followed by 10 weeks of individual face-to-face and phone-based performance coaching with motivational interviewing strategies and with weekly individual exercise sessions	10 weeks	Pretest-posttest
Biebel, 2010 ¹³	Police officers, inspectors, and civilian personnel (% male NR) N = 104 United States	To improve immediate and long-term health status and increase the lifespan of officers.	All groups received a physical assessment I1: Weekly or monthly contact with a wellness coordinator in-person at workplace I2: Same as I1 but contact was by telephone I3: Same as I1 but contact was by email	4 months (suspended due to budget crisis)	Pretest-posttest
Elliot, Goldberg, Duncan, et al, 2004 ¹⁶	Firefighters N = 33 (% male NR) United States	Improve nutrition and physical activity practices and optimize percent body fat	All groups initially received results of a physical, laboratory and dietary assessment. I1: Four one-on-one counselling sessions (≤60 min/session) using motivational interviewing, with negotiated series of follow-up in-person or phone contacts and one visit with a physician (~15 min) to discuss results of initial assessment. Participants received a health and fitness guide developed for this project. I2: Ten team-based classroom sessions (45 min/session) facilitated by a trained peer. Same education content and health and fitness guide as I1 and similar contact time. Team activities scheduled during weeks when sessions not held. C: Usual care	6 months	RCT
Geril and Huijbrechts, 2010 ¹⁸	Firefighters N = 186 (% male NR) United States	Improve health and fitness	I: Circuit training sessions that included strength training and stretching exercise; separate aerobic endurance exercise trainings; presentation by an exercise physiologist to all cadets and new recruits (optional for incumbents) on importance of healthy lifestyle and impact of obesity on chronic disease risk	1 year	Pretest-posttest
Leffer and Grizzel, 2010 ¹⁹	Firefighters N = 252 (91% male) United States	Reduce injury rates subsequent to improved fitness	I: After a medical, physical and fitness examination, participants met with a physician contracted to the fire department for one-on-one education and health education sessions. In sessions, participants were encouraged to perform ≥30 min of cardiovascular exercise 4-5 times/ week. Participants were given individualized plans for achieving this goal. Sessions also addressed diet, weight loss, fitness and tobacco use as applicable. For follow up, participants received a letter providing results from the initial examination and additional health-related recommendations, including the need to control chronic conditions and follow up with a primary care physician to do so.	2 years	Pretest-posttest
Moe, Elliot, Goldberg, et al, 2002; ¹⁵ Elliot, Goldberg, Kuehl, et al, 2007; ¹⁷ MacKinnon, Elliot, Thoemmes et al, 2010 ²⁰	Firefighters N = 599 (97% male) United States	Improve nutrition and physical activity practices and optimize percent body fat	All groups initially received results of a physical, laboratory and dietary assessment. I1: One-on-one counselling using motivational interviewing and receipt of a health and fitness guide developed for this project. Year 1: 4 sessions ≤ 60 min each; 6-month phone check in with option of ≤ 5 hours contact in person or by phone. Year 2: 3-4 sessions x 45 minutes with option for additional follow-up phone calls. I2: Team-based classroom sessions facilitated by a trained peer. Same education content, and health and fitness guide as I1 but more contact time. Year 1: 11 sessions x 45 min with team activities scheduled during weeks when sessions not held. Year 2: 5 sessions x 45 min with team activities. C: Usual care Years 3-4: All participants received annual assessments, mailed written health risk appraisal, and access to website providing additional information to help interpret assessment results.	2 years (12 month and 2, 3, 4, 5 and 6 year follow-ups)	RCT
Rossomanno, Herrick, Kirk, & Kirk, 2012 ¹⁴	Sedentary, urban police officers N = 165 (79% male) United States	Improve body composition, cardiovascular and muscular fitness	I: Supervised job-specific moderate exercise sessions, with aerobic exercise (mostly walking on treadmill) progressing from 20 minutes, 3 days/week to 30 minutes, 5 days/ week and muscular strength training progressing from 2 sets of 5 repetitions 3 days/ week to 3 sets of 15 repetitions 5 days/week; encouragement to continue exercise on own after 6 months	6 months (12- and 18-month follow-ups)	Pretest-posttest

Note.

NR = not reported. I = Intervention group. C = control group

Post-tests assessments occurred at the end of the program unless noted in the Program Length column.

Table 2
Outcomes of Studies

Author, Year	Process	Outcomes	
		Economic/Workplace	Individual
Anshel and Kang, 2008 ¹²	39% dropout rate 61% completed one of the 6 programs		↑ physical fitness (p < .001) Improved lipid profile (p < .001) For study completers: 80% adherence with prescription for 3 times/week of cardiovascular exercise; 75% adherence for strength training 2 times/week
Biebel, 2010 ¹³	78% of participants returned retrospective surveys		22% of participants were deemed successful as they showed improvements of at least 20% on a composite measure of fitness Predictors of success: ↔ mode of contact (p = .11) ↔ frequency of contact (p = .06)
Elliot, Goldberg, Duncan, et al, 2004 ¹⁶	100% completion rate I1: 6 hours was the average time spent by each participant with the intervention curriculum I1: 12 hours was the average time required for each participant with the counselor's time included I2: ~9 hours was the average time spent by each participant with the intervention curriculum		I1 and I2 compared separately to Control: ↔ BMI (Both groups, p > .05) ↔ body weight (Both, p > .05) ↔ peak VO ₂ (Both, p > .05) ↔ triglycerides (Both, p > .05) ↔ HDL cholesterol (Both, p > .05) ↓ LDL cholesterol (Both p < .05) ↑ personal exercise habits (I2 only, p < .01) ↔ days/week of exercise (Both, p > .05) ↓ behaviors related to higher-fat diet (I1 only, p < .01) ↔ vegetable & fruit servings/day (Both, p > .05) ↑ shift workers' cohesion, perceived (I2 only, p ≤ .05) ↑ healthy eating habits of other shift workers, perceived (I2 only, p ≤ .01) ↑ exercise habits of other shift workers, perceived (I2 only, p ≤ .01) ↑ personal monitoring of diet (I1 only, p ≤ .01) ↓ depression (I1 only, p ≤ .05)
Geril and Huijbregts, 2010 ¹⁸	81% of the 230 eligible firefighters completed the program baseline fitness testing 48% completed follow up fitness testing 59% of these completed the follow up survey	Comparison of year during which health and wellness program held to previous year: ↓ days lost by 41% ↓ claims by 19% ↓ cost by 69% (US \$85,621) Comparison of year during which health and wellness program held to previous 4 years: Total potential savings of program was US \$349,084	Did not test for significance ↑ BMI by 1% ↑ sub-maximum VO ₂ by 8% ↑ push-up repetitions by 15% ↑ abdominal endurance by 32% ↑ lower back / hamstring flexibility by 36% ↑ upper body strength by 20%
Leffer and Grizzel, 2010 ⁹	83% of the 252 eligible firefighters completed the initial examination 100% participation in the study of those who completed the initial examination Cost of examination was \$200/ per firefighter	↓ mean annual injury rate from pre-test by 40% in year 1 (p < .01) and by 60% in year 2 (p < .01) Savings from fewer injuries was in year 1 US \$254,980, representing 171 days of regular duty saved, and in year 2 US \$322,080, representing 216 days of regular duty Return on investment was 4.2:1 in year 1 and 4.6:1 in year 2 suggesting program was cost-effective for preventing injury	↔ BMI (p > .05) ↔ systolic blood pressure (p > .05) ↔ diastolic blood pressure (p > .05) ↔ total cholesterol (p > .05) ↔ triglycerides (p > .05) ↔ HDL cholesterol (p > .05) ↔ LDL cholesterol (p > .05)

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Injury reduction. One study aimed to reduce injury. Leffer and Grizzel¹⁹ successfully reduced injury rates by offering individualized exercise plans and meetings with a physician, resulting in a decrease in the annual injury rate from pre-test of 40% after one year (p < .01) and of 60% after 2 years (p < .01).

Dietary and physical activity practices. The 4 studies examining changes in dietary and physical activity practices showed improvements in

these practices.^{12,14-16} Anshel and Kang¹² reported high adherence with exercise (80%) and strength training prescriptions (75%) over 10 weeks among study completers. In an intervention group that received individual counseling Elliot et al¹⁶ observed 6-month decreases in behaviors related to a higher fat diet (p < .01), and in an intervention group that received classroom sessions that presented comparable content, 6-month increases in personal exercise habits (p < .01). However, no significant

Table 2 (continued)
Outcomes of Studies

Author, Year	Process	Outcomes	
		Economic/Workplace	Individual
Moe, Elliot, Goldberg, et al, 2002; ¹⁵ Elliot, Goldberg, Kuehl, et al, 2007; ¹⁷ MacKinnon, Elliot, Thoemmes, et al, 2010 ²⁰	Delivered with high fidelity I1: Participants averaged 4.4 interactions (SD 1.5) I2: 73% of participants reported attending ≥ 7 of 11 team sessions and 23% attended all team sessions US \$25/participant for 12 materials		I1 and I2 compared to control 12-month follow-up: ↑ overall well-being (Both groups, $p < .05$) ↓ BMI (Both, $p < .05$) ↓ body weight (Both, $p < .05$) ↔ peak oxygen uptake (Both, $p > .05$) ↑ abdominal endurance in 1 min (Both, $p < .05$) ↔ physical activity (Both, $p > .05$) ↑ health dietary behavior (Both, $p < .005$) ↑ fruit & vegetable intake (I1, $p < .05$; I2, $p < .01$) ↔ % calories from fat (Both, $p > .05$) ↔ physical activity benefits & understanding (Both, $p > .05$) ↑ physical activity social support (I2 only, $p < .05$) ↑ dietary understanding (I2 only, $p < .005$) ↑ dietary social support (I2 only, $p < .001$) At other follow-ups, few of the statistically significant benefits seen at the 12-month follow-up were maintained with no sustained benefits. At 12-month follow-up, 51% reported engaging in 150 min/week of physical activity Baseline to 12-month follow-up ↓ BMI ($p < .001$) ↓ body weight ($p < .01$) ↑ cardiovascular and muscular fitness for job qualifications ($p < .01$) Baseline to 18-month follow-up ↑ BMI ($p < .01$) ↑ body weight ($p < .01$) ↓ cardiovascular and muscular fitness for job qualifications ($p < .01$)
Rossomanno, Herrick, Kirk, et al, 2012 ¹⁴	Participants completed >98% of prescribed exercise		

Note.
*Composite Score
↑: Increase in scores; ↓: Decrease in scores; ↔: no statistically significant difference; p-values are provided where statistical significance was tested.
For individual outcomes, unless otherwise noted, comparisons are between pre-test and post-test for non-experimental designs, and for experimental designs comparisons are between intervention and control/comparison groups in changes pre-test to post-test.

changes in days per week of exercise or in vegetable and fruit servings per day occurred in either group ($p > .05$). Moe et al¹⁵ observed 12-month increases in fruit and vegetable intake in an intervention group that received individual counseling ($p < .05$) and in an intervention group that received classroom sessions ($p < .01$). Both groups also experienced significant increases in healthy dietary behavior ($p < .005$), although neither group experienced significant changes in physical activity ($p > .05$) or in percentage of calories from fat ($p > .05$). Last, Rossomanno et al¹⁴ reported that 51% of previously-sedentary participants were meeting guidelines for 150 min per week of physical activity at the 12-month follow-up.

Body composition. Of the 5 studies examining changes in body composition,^{14-16,18,19} 2 resulted in improvement. Moe et al¹⁵ observed decreases in BMI ($p < .05$) and body weight ($p < .05$) over 12 months; Rossomanno et al¹⁴ observed decreases in

BMI ($p < .001$) and body weight ($p < .01$) over 6 months. However, Elliot et al¹⁶ observed no change in BMI ($p > .05$) or body weight ($p > .05$) over 6 months. Likewise, Leffer and Grizzel¹⁹ reported no change in BMI over 2 years ($p > .05$), and Geril and Huijbregts¹⁸ reported a 1% increase in BMI over one year (statistical significance not tested).

Quality Assessment

Using a standardized tool,¹¹ one study received a “moderate” global rating,¹⁹ whereas the remaining 6 studies received “weak” global ratings (Table 3).^{12-16,18} Inadequate reporting of potential confounding variables (including controlling for confounding variables), selection bias, lack of assessor and participant blinding to research questions, and withdrawal differences among study groups were common methodological limitations across studies.¹²⁻²⁰

The lowest scoring rating item was confound-

Table 3
Effective Public Health Practice Project Quality Assessment Ratings

Study	Selection Bias	Study Design	Confounders	Blinding	Data Collection Methods	Withdrawals and Dropouts	Global Rating ^a
Anshel and Kang, 2008 ¹²	Weak	Moderate	Weak	Weak	Strong	Moderate	Weak
Biebel, 2010 ¹³	Weak	Moderate	Weak	Moderate	Strong	Weak	Weak
Elliot, Goldberg, Duncan, et al, 2004 ¹⁶	Strong	Strong	Weak	Weak	Strong	Strong	Weak
Geril and Huijbregts, 2010 ¹⁸	Strong	Moderate	Weak	Weak	Strong	Moderate	Weak
Leffer and Grizzel, 2010 ¹⁹	Moderate	Moderate	Weak	Moderate	Strong	Strong	Moderate
Moe, Elliot, Goldberg, et al, 2002; ¹⁵ Elliot, Goldberg, Kuehl, et al, 2007; ¹⁷ MacKinnon, Elliot, Thoemmes et al, 2010 ²⁰	Strong	Strong	Strong	Weak	Strong	Weak	Weak
Rossomanno, Her- rick, Kirk, and Kirk, 2012 ¹⁴	Moderate	Moderate	Weak	Weak	Strong	Strong	Weak

Note.

a Global ratings: Strong (no Weak ratings), Moderate (one Weak rating), and Weak (≥ 2 Weak ratings)

ers, with 6 studies scoring a weak rating because they did not control for confounders. Only one study received a strong rating because the researchers controlled for sex, health status, and time of shift work.¹⁵ The highest scoring component was data collection methods, with all studies scoring a strong rating because the tools for primary outcome measures were described as reliable and valid. Other sources of data included assessment/screenings, objective data that was captured by the researcher, and medical reports or vital statistics for the extraction of the data.

DISCUSSION

These findings show some promising results with good completion rates, high satisfaction with programs, and promising physical activity and dietary behavior change outcomes. However, results were mixed for other individual outcomes (physical fitness and body composition), likely due to the high heterogeneity in study designs, programs offered, and sampling among a small number of studies available for inclusion in the review. Although such

study variations did not allow for the synthesis of data, this review provides initial indications that workplace health and wellness programs within police and firefighting workplaces can provide benefits to employers and employees.

Although most evaluators of the studies examined reported data collection methods and the study outcomes adequately, the inadequate reporting of potential confounding variables, selection bias, assessor and participant blinding to research questions (it is acknowledged that blinding participants to research questions can be difficult), and withdrawal differences among study groups were common methodological limitations across studies. These omissions did not allow for a comprehensive assessment of study quality, generalizability of findings, or potential sources of bias and led to no study receiving a strong global quality rating score. Overcoming such limitations will be valuable to future researchers and police and firefighting personnel, for the evaluation of future evidence-based health and wellness programs in these settings, and publication of evaluation results of such programs

in peer-reviewed literature is imperative to advance the field. More generally, such evaluations are either not adequately being reported in the literature currently (hence the small number of studies in this review), or health and wellness programs in these settings are not being evaluated.

Comparing our findings to those of a systematic review of the impact of worksite wellness programs across industries²¹ suggests that fewer rigorous health and wellness program evaluations are reported in the scientific literature for police and firefighter workplaces than for other workplaces. In that earlier review, 33 evaluation studies that included comparison or control groups were located.²¹ Only 3 of the 7 studies we located included a comparison or control group. Over half of the studies in the earlier review (N = 17) used a RCT design, whereas we located only 2 studies that used a RCT design, one of which was a pilot study¹⁶ preceding the main study.^{15,17,20} That main study was the only study included in our review that was also included in the earlier review. Thus, it appears that the evaluation methods at police and firefighter workplaces must be more rigorous before they will contribute to the body of literature on workplace health and wellness programs.

As in the current study, evaluations of health and wellness programs in workplaces more generally focus on exercise, diet, and physiological marker outcomes, and most of these show beneficial effects.²¹ Modalities reported in the current and previous review are similar as well, with self-help and educational materials, individual or group counseling, and health risk assessments being the most used modalities reported in both reviews. However, one-fourth of the programs described in the earlier review included environmental changes to workplaces, including availability of food choices,^{22,23} physical activity opportunities^{22,24} and reduction of occupational exposures.²⁵ Such changes were not evident in the studies included in the current review. With current health promotions practice, acknowledging the relevance of individual and environment determinants of behavior, including environmental changes at firefighting and policing workplaces, could produce greater improvements in employee health than behavior change strategies alone. Moreover, a feature of the programs reviewed earlier was that most included incentives for

program enrollment, participation, survey completion or a combination of these, although evaluation of the impact of using incentives was minimal and inconclusive. Such incentives were not reported for the studies in the current review, and one program was mandated for all staff.²⁵ Few studies in either review assessed workplace outcomes, indicating that economic evaluation is not common as part of workplace wellness program evaluations.

Generalizability of Findings

To our knowledge, this study is the most comprehensive review of health and wellness programs for police and firefighting populations. However, several factors influence the generalizability of its findings to other police and firefighting workplaces and to other health and wellness programs. First, the findings are based on just 7 studies, all of which were conducted in the United States. Second, the quality assessment conducted as a part of this review revealed weaknesses that should be considered when interpreting the generalizability of our findings. These include poor control for potential confounding variables, and poor blinding of assessors and study participants (Table 3). Despite these factors, this review provides significant insight into the state of the evidence and highlights key directions for future research.

Limitations

Although a comprehensive literature search was performed, it is possible that relevant and possibly effective programs were undetected. This may have occurred because the grey literature was excluded. In the initial search, such literature was included, but poor evaluation methods and descriptions of programs led to the authors' decision to exclude studies found in that literature. Nonetheless, publication bias could be present. Also, due to the small number of studies and the heterogeneity in populations, outcomes and follow-up periods, a meta-analysis or a discussion of trends in outcomes was not feasible. Additionally, it was beyond the resources of this project to include papers published in languages other than English.

Recommendations for Future Research

To advance the field, organizations undertak-

ing and evaluating health and wellness programs at firefighting and policing workplaces are encouraged to identify, report, and control for potential confounding variables. Moreover, it is valuable to recruit a control or comparison group to evaluate the program with greater rigor. In addition, random assignment of participants to groups to avoid any selection bias would make samples more likely to represent target populations. Furthermore, blinding study outcomes and research questions to assessors and participants (to the extent possible) can protect against detection and reporting biases respectively. Finally, describing both the numbers and reasons for withdrawals and drop-outs would assist improving the elements of future programs.

This review evaluated the evidence from health and wellness programs at the workplaces of police officers and firefighters aimed at improving health outcomes of employees. The findings from the studies reviewed show some promising results with good completion rates, high satisfaction with programs, and promising changes in individual behaviors. However, empirical evidence for effective health and wellness programs in police and firefighter populations is scarce. Better evaluation and documentation of such programs is needed to advance research in this field.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

Police and firefighters are at elevated risk for adverse mental and physical health outcomes when compared to the general population. Given the types of physical stress encountered, these civil servants are in need of workplace health and wellness programs tailored to their unique organizational and occupational demands. This review provides evidence of the potential benefits for these individuals, including positive changes in health behaviors. Police and firefighting organizations should be encouraged by the levels of staff engagement in the studies included in this review, such as good completion rates, high levels of program satisfaction, and return on investment when measured. Police and firefighting organizations are urged to document the procedures and results of such programs, and use rigorous methodological designs and evaluation where feasible to add to the evidence base.

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Human Subjects Approval Statement

The study was exempt from human subjects review.

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