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The Los Angeles Lift Off: a sociocultural environmental change intervention to integrate physical activity into the workplace

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Abstract

Purpose. To present the development and feasibility testing of a sociocultural environmental change intervention strategy aimed at integrating physical activity into workplace routine.

Design. Randomized, controlled, post-test only, intervention trial.

Setting. Los Angeles County Department of Health Services' worksites.

Participants. Four hundred forty-nine employees, predominantly sedentary, overweight, middle-aged women of color, distributed across 26 meetings.

Intervention. A single 10-min exercise break during work time involving moderate intensity, low-impact aerobic dance and calisthenic movements to music.

Measures. Primary—level of participation, particularly among sedentary staff; secondary—self-perceived health status, satisfaction with current fitness level, and mood/affective state.

Results. More than 90% of meeting attendees participated in the exercises. Among completely sedentary individuals, intervention participants' self-perceived health status ratings were significantly lower than controls' (OR = 0.17; 95% CI = 0.05, 0.60; $P = 0.0003$). Among all respondents not regularly physically active, intervention participants' levels of satisfaction with fitness were more highly correlated with self-ranked physical activity stage of change ($r = 0.588$) than the control participants' ($r = 0.376$, $z = -2.32$, $p = 0.02$). Among the completely sedentary, control participants reported significantly higher levels of energy than did intervention participants ($P < 0.01$).

Conclusions. Captive audiences may be engaged in brief bouts of exercise as a part of the workday, regardless of physical activity level or stage of change. This experience may also appropriately erode sedentary individuals' self-perception of good health and fitness, providing motivation for adoption of more active lifestyles.

Keywords: Physical activity; Obesity control; Organizational change; Lifestyle change; Sociocultural environment; African Americans; Latinos; Minority populations

Introduction

Obesity has reached epidemic proportions in modern society, with nearly two in three US adults now classified as overweight [1–4]. The economic costs of obesity and sedentariness are considerable [5–8]. Relatively little sustainable weight-related lifestyle change has been produced by individually targeted interventions [9–11], even among

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their comparatively affluent and highly motivated volunteer samples. This failure has largely been attributed to a pervasive modern environment promoting sedentariness and excessive food consumption, particularly of the highly palatable but nutrient-poor variety [12,13].

Ecological models that center on environmental-level change are now being utilized more frequently in the field of physical activity promotion, which has traditionally relied on individual-level change models [14–18]. However, few environmental intervention studies have been conducted to date, and their strategies have focused on the physical environment [19,20], for example, posting signs/banners encouraging stair use [21–23], creating and promoting walking trails [24], and marking walking routes in cities [25]. Intervention effects of such strategies have been relatively small, raising questions about their ability to contribute meaningfully to the Centers for Disease Control and Prevention/American College of Sports Medicine (CDC/ACSM) recommendation of at least 10-min bouts toward an accumulation of at least 30 min nearly every day [26]. Importantly, many of these interventions are less effective or ineffective in ethnically or socioeconomically marginalized population segments, or do not include sufficiently large samples of these populations to present subgroup analyses [27–29]. For example, Andersen et al. [21] increased stair usage among whites in a suburban Baltimore shopping mall from 5.1% to 7.5% or 7.8%, depending upon the sign utilized; among blacks, however, stair usage changed from 4.1% to 3.4% or 5.0%. Similarly, in a random digit dial telephone survey evaluating the impact of walking trail construction and promotion in rural Missouri, Brownson et al. [43] found that blacks and those of lower SES were less likely to have access to the trails and were less likely to use them if they had access. While, among those using the trails, women and less formally educated individuals were more likely to report increased walking, no evidence was presented that trail use significantly increased the proportion meeting CDC/ACSM activity recommendations, nor was that outcome likely when 43% of all respondents had to travel 15 + miles to reach a trail. Preliminary evidence suggests that the social environment may be at least as effective in behaviorally influencing physical activity participation as the physical environment [30,31]. Greater attention to the sociocultural environment complementing efforts to change the physical environment is particularly critical to intervention success in underserved communities, given their more substantial cultural and economic barriers to physical activity participation (e.g., Kumanyika [32]; Galbally, 1997 [33]). Thus, multi-level intervention, addressing the social, physical and economic environments as well as the individual, is necessary to reflect a truly social ecological approach to physical activity promotion [16–18].

Worksites are the major settings for environmental intervention as venues in which to systematically reach captive audiences of working adults [34]. Cross-sectional studies have demonstrated higher health care costs and absenteeism rates among the less fit, with clear potential for economic benefits to employers who improve employee fitness levels [35–37]. Most worksite interventions promoting physical activity, however, have disproportionately engaged younger, more highly educated, white European-American males in large private corporate settings [38,39]. In reviews of the more rigorously constructed studies (acceptable levels of study retention, recruitment across job categories/statuses, long-term follow-up), observed effect sizes have been small at best [38,40], probably because the "volunteer" nature of these interventions engages primarily the more fit. The focus of these interventions has mostly been on individual-level change—even when social support for physical activity is cultivated (walking groups, exercise classes), it is usually during non-paid employee discretionary time.

Multi-level change models [13,41,42] that incorporate ecological-level or "upstream" approaches to integrate physical activity into the workday are early in their development. However, there is evidence of receptivity to and utility of these interventions. Brownson et al. [43] found that employees' belief in the policy that employers should provide time for exercise was positively correlated with their physical activity levels. An older study targeting organizational practice, policy, and environmental influences demonstrated more favorable outcomes than most worksite interventions [44]. Also, in one small recent study in Finland, supervised group exercise twice weekly at the end of the workday (on paid time) improved the physical capacity of female home health workers [45]. However, a dearth of literature exists with respect to intervention strategies changing the organizational fabric of the workplace to include physical activity. Moreover, critical features of these strategies and innovations have not been evaluated from an organizational dynamics perspective, for example, diffusion and institutionalization processes [46,47]. This perspective identifies characteristics of the innovation that hinder or enhance adoption within organizational settings.

Sociocultural approaches to influence population behavior change may be guided by social cognitive theory (SCT), which posits that learning occurs through observation and imitation of admired role models, individuals perceived as worthy of emulation [48]. A key premise of SCT is that certain sociodemographic similarities exist between individuals and their role model choices, for example, ethnic and gender congruence [49]. However, cultivation of admired role models in the context of physical activity promotion ideally involves building self-efficacy (another cornerstone of SCT) beyond the motivation and assertiveness necessary, for instance, in requesting a mammography referral. This self-efficacy enhancement would, in turn, emanate from positive experiential learning involving skill demonstration, repetition, and acquisition. Given that social support is a major predictor of sustained involvement in physical activity [11], leading by example includes not only initiating and performing a given set of behaviors in front of an audience

(modeling), but interacting with that audience, encouraging their continuing participation, and fostering interactions between audience members during the activity. In fact, this sort of engaging leadership style has been associated with greater enjoyment of physical activity, particularly in the context of supportive group dynamics [50]. Supportive group dynamics also increase the probability of future involvement in the activity [50]. Commitment of organizational leaders on-site, as manifested in role modeling by participation in group physical activities, has also been associated with increasing and institutionalizing physical activity in government agencies and community-based organizations [51–53].

The purpose of this paper is to present the development and feasibility testing of a sociocultural environmental change intervention strategy designed to integrate physical activity into the workplace. The first article describing this intervention strategy established its feasibility and acceptability at the organizational level [54]. In the current study, intervention feasibility/acceptability is assessed at the individual level within the context of a government agency's worksites. A randomized, controlled, post-test only trial was utilized to assess the level of participation in and immediate psychological effects of a single 10-min exercise break integrated into a regularly occurring meeting or event during work time at Los Angeles County Department of Health Services' (LAC DHS) worksites. The a priori hypothesis, based on pilot study findings, was that individuals could be engaged in brief bouts of moderate intensity exercise across the weight status and physical activity level continuum, and that this exercise participation would be associated with positive changes in affect. Implications of study findings are discussed for the field of physical activity promotion in terms of "minimal" environmental change interventions, particularly targeting underserved populations.

Methods

Intervention strategy development/formative research

The Los Angeles *Lift Off* strategy was implemented in the LAC DHS and was designed to change sociocultural norms pertaining to physical activity participation and to increase the visibility of department efforts to address the obesity epidemic. The intervention, which consisted of a 10-min fitness or exercise break (*Lift Off*), was integrated into long (>1 h) meetings and events during work time, particularly those in which refreshments were served. The strategy is a part of a county social marketing effort, *Fuel Up/Lift Off! LA* (*Sabor y Energia*), funded by the USDA-supported California DHS' Nutrition Network program, aimed at shifting some of the responsibility ("cost") for healthy lifestyle change/maintenance from the individual to organizational structures in society.

The exercise breaks, composed of a series of simple aerobic dance/calisthenics movements with catchy titles (e.g., the Hulk, the Hallelujah, the Knee High), were developed by county physical activity promotion experts. They were intentionally designed to be appropriate for unfit, sedentary, overweight adults in ordinary street attire. The intervention length reflected consensus about the minimum duration of physical activity (10 min) required to "count" toward the daily recommendation of the CDC/ACSM. The intervention was also targeted to largely unmotivated "captive audiences" (rather than willing volunteers) within environments with resource and space constraints [55]. The production of immediate benefits in terms of improved meeting dynamics/productivity, feelings of well-being, and confidence and skill development (positive reinforcement) was expected to motivate these workers to generalize physical activity behaviors to other occasions and settings.

After a period of pre-testing that included these breaks during work time in more than 500 county meetings with anecdotally positive responses and few attendees electing not to participate (generally < 10%), protocols for these exercise breaks were formalized and recorded in English- and Spanish-language videotape, audiotape, and holographic mouse pad materials.[1] These materials and protocols were then used by designated facilitators, who, before training by LAC DHS staff, had no exercise promotion background. Materials were culturally tailored to African-American and Latino audiences (e.g., through music selection and graphics), but reflected inclusiveness by featuring video subjects representing a broad range of ethnicity, age, agility, weight status, physical limitations, and both genders. While the English-language video is introduced by a fit-appearing black female physician-senior manager (AKY) playing basketball with co-workers, the leader of the exercise breaks in the video is a mature, overweight, non-athletic, black woman. County health promotion staff then trained nursing and health education staff to conduct these breaks and to train others to conduct them, utilizing these *Fuel Up/Lift Off! LA* materials. These breaks proliferated in meetings, presentations, health fair appearances, and community gatherings/events in which County public health staff participated, particularly after the Director of Public Health (JEF) circulated a memorandum to senior managers encouraging their inclusion.

Study design

This study was designed to address the broader goal of increasing physical activity participation in the workplace. The process of conducting the study followed a participatory research model in which Public Health senior and middle managers were consulted to assist in molding a study design and approach manageable during work hours within "real world" constraints. A randomized, controlled, post-test-only trial was selected to evaluate the immediate effects of the *Lift*

[1] Note. These materials available from first author.

Off intervention on participant motivation- and mood-related variables among Los Angeles County employees. For example, plans for collecting baseline data before implementing the exercise breaks were discarded because the consensus among stakeholders and selected staff was that the time and personnel resources required for the pretest would impose undue burden and decrease the likelihood of participation (by meeting leaders, and staff themselves). Institutional Review Board approval was obtained from the Los Angeles County Department of Health Services in June 2001.

Master schedules of county meetings and training sessions lasting more than 1 h in centrally located buildings were obtained from facilities management staff and program staff. Meeting leaders/convenors were contacted by the study coordinator (a master's-level trained exercise physiologist) and advised of study procedures and of the Director of Public Health's request for cooperation. For intervention meetings, permission was requested to conduct a 10-min exercise break followed by a brief survey of staff "wellness and morale" halfway through the meeting. For control meetings, leaders were asked to break for 10 min halfway through the meeting per usual (bathroom, telephone, etc.), with the group completing the survey following the break. Following introduction of the study according to a set script, including reading of a letter requesting cooperation from the Director of Public Health, written informed consent was obtained. The exercise break was conducted following a set routine using the *Fuel Up/Lift Off! LA* audiotape of music and voice-over instructions as earlier described. Surveys were distributed with assurance of confidentiality, collected and marked with an arbitrary meeting identification code. Data were stored in a locked file cabinet and retrieved only at the time of data entry.

A pilot study was conducted in four meetings with 68 individuals (3 intervention meetings with 48 individuals, 1 control meeting with 20) to determine the feasibility of the approach and to produce effect size estimates used in the statistical power calculations. Significantly lower ratings of feelings of depression, and higher ratings of energy and overall mood were reported in intervention vs. control subjects participating in the pilot.

Sample

Data on the population from which the sample was drawn are presented for the county as a whole, since meeting/training seminar attendees were primarily from the Public Health branch of the Department of Health Services (DHS), but also included non-Public Health DHS employees and other county staff. According to the Los Angeles County Department of Human Resources, there were 81,383 full-time, permanent county employees (including those employed by the courts) in 2001. Black women comprised the largest ethnic-gender group at 15,450, followed by white men (14,222), Latinas (13,203), white women (10,249), Latinos (8800), Asian/Pacific Islander women (7734), black men (6508) and Asian/Pacific Islander men (4499). Fully 70% were people of color. The median age was 46, with nearly 50,000 who were 40 years of age or older. Nearly half or 39,586 earned less than $40,000 per year. More than half (41,385) had 12 or more years of service.

After initiation of the study, meeting leaders referred others by word-of-mouth, and some meeting leaders enrolled multiple (different) meetings. Data on the total number of meeting leaders contacted and number of refusals were not available. As meetings were scheduled, they were randomly assigned to intervention or control conditions using the following procedure: a coin toss determined the assignment to condition of the first meeting, alternating assignment thereafter as meetings were enrolled. Between June 2001 and May 2002, 26 meetings were enrolled, 11 intervention, and 15 control. Altogether, there were 449 participants, 189 in the intervention condition, and 260 in the control condition. Total number of attendees and numbers actually participating in the exercises were noted by the study coordinator. Meeting attendance ranged from 8 to 28 for the intervention condition, and 7 to 30 for the control. Approximately 90% of attendees completed study questionnaires. Attendees were advised not to complete questionnaires if they had already attended a meeting included in the study, and there was no evidence of duplicate identifiers on data entry.

Measures

The survey instrument was necessarily brief, as it had to be completed during regularly scheduled workday meetings/events. The primary outcome measure was the sociodemographic, anthropometric, and physical activity-related inclusiveness of the intervention as compared with these sample characteristics typical of non-work time interventions engaging only employees who actively sought to be involved in the intervention. Secondary outcome measures were mood state, health status, and satisfaction with physical fitness level.

Sociodemographic variables, including gender, race/ethnicity, age, and job title were assessed using items from the Los Angeles County Health Survey, or LACHS [56].

Body mass index (*BMI*) was calculated from self-reported weight and height in kg/m^2 using formula=703* weight (lbs.)/height^2 (in.).

Health status was assessed by an LACHS item asking respondents to rate their general health on an ordinal, 5-response category scale from 5 (excellent) to 1 (poor).

Stage of change for physical activity was assessed using a single item adapted from a questionnaire used in NCI-funded research studies [57] containing a response option corresponding to one of the five stages of change and producing a stage classification.

Satisfaction with current fitness level was assessed using a single item rated from 1 (not at all satisfied) to 10 (extremely satisfied).

Physical activity level was assessed using an adaptation of the International Physical Activity Questionnaire (e.g., Tu-

dor-Locke et al. [58]) developed by an expert panel of the World Health Organization/CDC and utilized in the LACHS (Yancey et al. [27]). The items capture days and minutes of vigorous activity, moderate activity and walking, work-related and leisure time activities and also daily time watching television/using the computer while not at work.

Mood state was assessed using relevant items capturing ratings of mood, depression, tension/anxiety, and ability to concentrate, and levels of alertness, energy, and stress on a scale of 1 (not at all) to 10 (extremely high) from an instrument developed at the Stanford University Center for Research in Disease Prevention and Health Promotion [59]. While this measure has not been used widely in exercise physiology research like those of Thayer [60], Gauvin and Rejeski [61], or the Profile of Mood States [62], it was chosen because of its: (1) development using healthy, adult employees of a California corporation, a population more comparable to this study sample than the collegiate samples of most exercise physiology studies; (2) brevity, given "empirical evidence suggesting that simple, straightforward ratings can be as or more effective than more elaborate psychometric measurement instruments" [59]; and (3) availability at no cost.

Analysis

Data were entered into a Microsoft Excel database. Data cleaning and bivariate analyses were performed using SPSS version 10.1. Ordered logistic regression analyses, with standard errors adjusted to account for the clustering of respondents in meetings, were conducted using STATA version 7.0 (College Station, TX). The null hypothesis for the secondary outcomes assessed was that there would be no difference in mood state or satisfaction with current health or fitness level between those county employees participating in meetings with a 10-min exercise break compared to county employees participating in meetings with the usual phone/bathroom break. Subgroup analyses focused on sedentary individuals because this group is at greatest risk for physical inactivity-related diseases.

Results

Participation rates

More than 90% of meeting attendees stood during the exercise break and participated in the exercises, albeit at varying levels of intensity and adherence to form (similar to the level of variation captured in the filming of the *Fuel Up/Lift Off! LA* video).

Sociodemographic characteristics

Ages of participants ranged from 17 to 79 years, with a median age of 41 years. Nearly three of four (73.6%) were female. Of the 424 participants who indicated their ethnicities, 35% were Latino, 20% were African-American, 20% were white/European-American, 17% were Asian-American/Pacific Islander, 1% were Native American, 3% were biracial, and 3% self-identified as "other ethnicity." Of the 130 identifying readily categorizable job titles, 46.9% reported professional/technical jobs, while 53.1% were support personnel. There were no differences on any demographic measures between the experimental and control groups (all comparisons $P > 0.25$).

Health and physical activity status

The participants mean rating for self-reported health status was "good." Mean BMI was 27.0, range, 17–51, with 31.6% of participants categorized as overweight/non-obese (BMI = 25–29.9) and 25.0% as obese (BMI > 30). No significant differences in health status or BMI between intervention and control participants were identified. Respondents were relatively sedentary, with only 36.3% meeting CDC/ACSM recommendations for physical activity participation. About 11.8% were completely sedentary, reporting less than 10 min per week of continuous physical activity, and 52.1% reported intermediate levels of activity still not meeting CDC/ACSM recommendations. The mean daily time spent watching TV or using a computer while not at work was 2 h for the sample overall and 3.5 h among the completely sedentary. There were no significant differences in self-reported physical activity levels or levels of sedentary behavior between intervention and control participants overall (all $P > 0.50$). Among the completely sedentary, however, intervention participants had significantly higher BMI than control participants ($P < 0.05$).

Motivation-related effects

Stage of change distribution was roughly equivalent to that reported in other similar worksite health promotion interventions (e.g., Neiger et al. [25]–6.4%–22.3%–28.0%–10.8%–32.5% for Stages 1–5, respectively): Stage 1 (pre-contemplation)-4.6%; Stage 2 (contemplation)-21.9%; Stage 3 (preparation)-36.2%; Stage 4 (action)-12.8%; Stage 5 (maintenance)-24.6%, with no significant differences between intervention and control participants ($\chi(4) = 6.0$, $P = 0.20$). The distribution for completely sedentary participants, regardless of experimental assignment, was quite different, as expected: Stage 1—19.6%; Stage 2—58.8%; Stage 3—17.6%; Stage 4—2.0%; Stage 5—0.0%.

Results of ordered logistic regression analyses showed that completely sedentary respondents in the intervention group rated their health status significantly lower than did completely sedentary controls (OR = 0.17; 95% CI = 0.05, 0.60; $P = 0.0003$). Further analysis, however, suggested that BMI status was a confounder. Conditional ordered logistic regression with BMI included as a covariate reduced the relationship between perceived health status and intervention

exposure (OR = 0.39, 95% CI = 0.06, 2.56), but some of this could be attributed to the reduced sample size occasioned by the inclusion of BMI (missing for some participants) in the analyses. These same analyses, however, showed that BMI status was related to perceived health status for participants who were more physically active but not meeting CDC/ACSM recommendations (OR = 0.93, 95% CI = 0.89, 0.97). Thus, higher BMIs were associated with lower perceived health status—but only if the individuals were at least somewhat physically active. Hence, increasing physical activity among the sedentary may assist them in making the connection between their weight and health status.

While there was no accompanying significant main effect on fitness satisfaction, among respondents not meeting CDC/ACSM recommendations for physical activity (64% of the sample), intervention participants' satisfaction with current fitness levels was more highly correlated with self-ranked physical activity stage of change ($r = 0.588$) than control participants ($r = 0.376$, $z = -2.32$, $P = 0.02$). This suggests that intervention participants who had not advanced as far in making changes to adopt a more active lifestyle were less satisfied with their fitness levels than were those at a comparable stage of change in the control group. Thus, the intervention was associated with lessened self-perception of good health, and, perhaps, less satisfaction with fitness levels, among the relatively sedentary.

Mood-related effects

Responses to affect-related measures could reflect either ephemeral states (e.g., induced by a bout of exercise) or by enduring traits (such as chronic depression). To control for affect-related differences in chronic depression, respondents were queried about how sad or "blue" they felt over the past week as a measure of their baseline emotional state. The effect of the exercise intervention on depressive feelings was captured by a question about current depressive feelings in the Stanford measure. The following analyses include "feeling sad or blue over the last week" as a covariate. Logistic regression analyses showed no overall association between exposure to experimental condition and any of the affective measures (all $P > 0.12$). However, among the completely sedentary, control participants reported significantly higher levels of energy than did intervention participants ($P < 0.01$). Among the regularly active (those meeting CDC/ACSM recommendations), there was no difference between those exposed to the intervention and those who were not ($P > 0.60$). There were no other differences in affect-related variables between intervention and control sedentary participants.

Discussion

These data suggest that a very diverse sample of predominantly overweight, relatively sedentary, middle-aged and older women of color may be engaged in brief bouts of group exercise as a part of the workday, regardless of their readiness to change physical activity level and without any adverse effect on their mood or well-being. While positive effects on affective state were anticipated and not found, these findings are consistent with recent evidence from exercise physiology/psychology studies that affective valence becomes less positive or more negative as exercise intensity increases and as duration progresses, for example, Ekkekakis and Petruzello [63], Bixby et al. [64]; VanLanduyt et al. [65]; Ekkekakis and Petruzello [66]. The lower energy levels reported immediately post-exercise by the completely sedentary intervention participants are not surprising, given their likely low fitness levels and greater exertion (relative intensity). Furthermore, participation in this intervention may produce short-term benefits, in that it appropriately lowers self perception, among less active individuals, that their health is good and, perhaps, that their fitness level is good. Being confronted experientially with one's own deconditioning, probably for the first time in a long time (anecdotally, a common refrain is, "Are you sure it's only been five minutes?!"), provides a "teachable moment" or "reality check" for more sedentary individuals in a supportive social context (most others are in the same "boat"). This may erode complacency, increase the perceived discrepancy between ideal and actual, and increase motivation to be more active. However, the limited scope of this study, and its lack of pre-test data, underscores the suggestive nature of these findings and the need for further investigation of this approach with more rigorous study designs.

These findings, and those of prior studies of this strategy [54,67], indicate considerable receptivity to physical activity introduced at the organizational practice level. As the sociocultural environment is at least as important as the physical environment in producing sustainable lifestyle change, such interventions that rely less on individual initiative and motivation to be active may have greater public health impact. Certainly, such sociocultural interventions may complement physical environmental interventions (e.g., stair prompts and walking trail creation/promotion) by increasing the "demand" for physical activity when the "supply" of opportunities is increased. Within communities of color, focusing interventions on the sociocultural environment is critical. Fewer resources are available in these communities in the face of greater challenges (e.g., outdoor safety concerns; fewer indoor recreational facilities; higher rates of overweight creating higher levels of perceived exertion and discomfort in stair climbing, and altered cultural norms (self-perception of normal weight vs. overweight status); more culturally tailored fast food/soda/alcohol advertising); and lesser resonance of mainstream messages and values in promoting healthy lifestyle change.

Critical features of an innovation can accelerate or hinder an intervention's diffusion within an organizational context [46]. From a diffusion process perspective, the exercise break

innovation has relative advantage (potential health and productivity benefits) compared to current practice. In the workplace, the exercise break can be implemented on a limited basis (trialability). Furthermore, as more research is conducted, results will become known and visible to increasing numbers of organizations (observability), for example, Crawford et al. [67]; Yancey et al. [68] along with an adaptation of this intervention strategy (''Exercise your Faith for Ten'') currently being implemented as a component of the CDC-funded *Health eAME* project of University of South Carolina and Medical University of South Carolina. In many workplaces, physical activity promotion is compatible with the mission of the organization [53]. Overall, this innovation has the potential to encompass features that favorably influence the speed and extent of the diffusion process [46]. As an added benefit with great diffusion potential, many of these workers are gatekeepers, decision-makers, opinion leaders, or service providers who directly or indirectly influence the health promotion practices of their clients, patients, colleagues, co-congregants, or constituents.

As noted earlier, several important limitations of this work should be highlighted. First, the post-test only design leaves the possibility of baseline differences between groups explaining observed intervention effects. One potential confounder not assessed in the survey was prior participation in an exercise break. Also, this design does not allow meaningful assessment of any experimental effect on stage progression—given that a higher proportion of the completely sedentary intervention participants were overweight, compared with controls, pre-existing differences in stages of change may explain the lack of difference in stage by experimental condition. However, the absence of overall significant differences between intervention and control participants in BMI and physical activity level, which are highly correlated with health status in cross-sectional studies [27], is a fairly good indication that randomization ''worked'' to produce equivalent groups on the dimensions of greatest relevance. This randomization success also lends confidence to the findings despite the failure of the randomization process to produce intervention and control samples of the same size (probably due to happenstance increases in numbers of meeting cancellations and postponements among intervention meetings). The brevity of the survey did not permit the assessment of several variables of great interest and explanatory value, for example, exercise self-efficacy. Lastly, the ability of such a socioculturally targeted intervention to contribute to meaningful population increases in physical activity level is unclear, though this limitation applies equally to the widely supported stair prompts, urban redesign, and walking trail construction/promotion physical environmental interventions.

In summary, this study demonstrated the feasibility, within a convenience sample of 26 meetings in a local health department setting, of brief bouts of group exercise as part of the workday. Supportive group dynamics [49] and role modeling [47] were implemented as part of the intervention and resulted in greater than 90% participation in exercise breaks by meeting attendees. Future research should investigate the long-term sustainability of exercise breaks in a variety of organizational settings. Randomized controlled trials conducted with sociodemographically diverse employee groups would be optimal in examining the long-term effects of exercise breaks incorporated into the workday on paid time, and including a variety of outcome variables such as work productivity, co-worker support for healthy lifestyles, workplace norms for healthy lifestyle adoption/maintenance, energy/alertness levels, physical activity levels, and physiological health/fitness status indicators. Finally, additional research is needed to unequivocally document the potential of sociocultural work setting environmental change (e.g., group exercise breaks) as a strategy to improve the health and well being of employees.

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