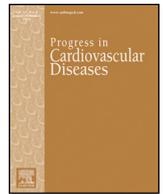




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## Implementing movement at the workplace: Approaches to increase physical activity and reduce sedentary behavior in the context of work

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### ABSTRACT

The purpose of this article is to highlight approaches to increase movement, physical activity (PA), and cardiorespiratory fitness, and reduce sedentary behavior (SB) in the context of the workplace. A deliberate strategy that will enable the successful promotion of movement at the workplace includes a business plan and rationale, an organizing framework, prioritization of interventions that are known to generate outcomes, and alignment of programmatic solutions with strong program design principles. Recommended principles of design include leadership, relevance, partnership, comprehensiveness, implementation, engagement, communications, being data-driven, and compliance. Specific evidence-based intervention examples are presented in the context of a socio-ecological framework including the individual, group, communications environment, physical environment, and policy domains. Increased movement at the workplace, as a result of promoting PA and reducing SB, generates important health outcomes across physical, mental, social, and economic domains and these benefits extend across the individual and organizational levels.

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### Introduction

A large body of scientific evidence supports the benefits of physical activity (PA), exercise, cardiorespiratory fitness (CRF), and reductions in sedentary behaviors (SB) across a host of outcomes including lower

risk for cardiovascular disease.<sup>1–4</sup> The new 2018 *Physical Activity Guidelines for Americans*, 2nd edition, and the scientific report supporting the guidelines, also indicate new evidence for health benefits of PA, including immediate and longer-term benefits for how people think, feel, function, and sleep.<sup>1,2</sup> There is no longer the need to accumulate PA in bouts of 10 min or more to receive the benefits of PA. The most recent 2018 guidelines also include two additional topics not previously addressed, *i.e.*, SB and interventions to promote regular PA.

The benefits of more movement, increased CRF, and less SB cover a large range of health and non-health issues.<sup>1–26</sup> Among this list of health benefits, just to name a few, are improved cognition, quality of life, sleep, physical function, emotional function, and reduced depression. Benefits

*Abbreviations:* CRF, Cardiorespiratory fitness; PA, Physical Activity; SB, Sedentary behavior.

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across various non-health domains include increased productivity, more meaningful co-worker interactions, reduced injury rates, lower presenteeism, and lower excess medical care costs.<sup>6,11,14,25,26</sup> Furthermore, the benefits extend beyond the individual level into the organizational level. For example, improved culture of health, increased company performance in the marketplace, enhanced corporate image, and improved retention of talent.<sup>15–23</sup> A more inclusive list of these benefits is presented in Table 1. As a result, it may be concluded that movement and CRF benefits both the worker and the company, an observation supported by health, social, and economic benefits.<sup>1–26</sup>

Unfortunately, the contemporary workplace is characterized by office work which is largely sedentary. PA requirements for work have steadily declined over the past half century. During this time, a significant shift in the proportion of jobs moving from a “moderate” activity category to “light and sedentary” categories has been noted.<sup>27</sup> The estimated impact of this shift is a decrease in excess of 100 cal in daily occupational energy expenditure. The sedentary nature of office work has increased sitting time to the degree that *prolonged* sitting time has emerged as a significant health concern for office workers.<sup>28,29</sup>

The workplace represents an important setting for the promotion of PA and reduction of SB.<sup>10,29,30</sup> It is the purpose of this article to highlight approaches to increase movement, PA, CRF, and reduce SB in the context of the workplace setting.

### Overarching principles of program design

The goal to implement a PA promotion program needs to be considered in context of the broader health and well-being strategy at the

**Table 1**  
Benefits of movement and physical activity for workers and the company.

Worker benefits	Company benefits
Improved cognition	Higher overall productivity
Improved quality of life	Lower illness absence
Improved sleep	Lower presenteeism
Improved bone health	Enhanced mood states
Improved physical function	Improved co-worker interactions
Improved emotional function	Improved team performance
Improved self-perceived general health status	Enhanced customer interactions
Improved overall health risk profile	Reduced injury rates
Reduced productivity loss	Improved overall health and well-being of workers
Reduced anxiety; improved stress management; enhanced mood	Improved culture of health and well-being
Reduced risk of depression	Enhanced marketplace performance
Lower risk of high blood pressure	Enhanced corporate image
Lower risk of adverse blood lipid profile	Enhanced retention of talent
Lower risk of type 2 diabetes	Enhanced talent recruitment
Lower risk of cancer	Higher job satisfaction
Lower risk of dementia (incl. Alzheimer's disease)	Reduced health care need
Lower risk of cardiovascular disease	Lower health care costs
Weight loss	Lower disability costs
Lower risk of weight regain	Reduced frequency of errors
Lower risk of all-cause mortality	
Lower risk of cardiovascular disease mortality	
More likely to see a doctor for routine care	
More likely to visit a dentist in the past year	
More likely to seek phone advice from a nurse	
Higher job satisfaction	
Increased worker income	
Lower debt	
Lower long-term unemployment	
Increased overall family earnings	
Reduced health care need and costs	
Reduced upper back neck pain	

Note: List is created based on information from references.<sup>1–23, 29, 30</sup>

workplace. The design of an overarching corporate health and well-being initiative should follow best practice principles that apply to all program types. Principles of program design should be based on what is known to be effective from the scientific literature and, optimally, such principles should have been applied in workplaces such that evidence-based strategies have shown practical utility through the use of case examples. Often, workplace initiatives combine multiple programmatic options into a single strategy labeled “PA” or “SB.” As a result, the *strategy* of promoting PA or reducing SB provides people with various options to choose from so as to integrate and fit such options within their lifestyles and behavioral preferences. The goal to reduce prolonged sitting time may be accomplished through, for example, the use of sit-stand desks, by integrating activity breaks throughout the day, or a combination of the two—forcing everyone into the same choice may not work well and is unlikely to yield high participation.<sup>29,30</sup> In 2009, a set of criteria were proposed to promote PA as a strategic corporate priority.<sup>30,31</sup> These criteria were directly linked to a set of essential elements for comprehensive worksite health promotion programs and health policy initiatives and presented in the context of a socio-ecological model. The criteria include<sup>31</sup>: 1) Organizing PA interventions within a framework that leverages the inter-relationships of individuals and their work environment; 2) Prioritizing the use of evidence-based and evidence-informed interventions; and 3) Aligning selected PA interventions with best practices for comprehensive, multi-component worksite health programs.

Against the backdrop of these criteria, a review of the research and practice literatures generated a set of 44 best practices that subsequently were organized into nine best practice principles for worksite health program design.<sup>32</sup> These principles are outlined in Table 2 and include: leadership, relevance, partnership, comprehensiveness, implementation, engagement, communications, being data-driven, and compliance. The principles have been successfully applied in the promotion of PA, the reduction of SB, and the design of various worksite health promotion programs, including efforts to develop a culture of health and well-being,<sup>33</sup> descriptions of the value proposition for worksite health and well-being,<sup>34</sup> design of workplace wellness recognition programs,<sup>35</sup> recommendations for the design of active workplaces,<sup>36</sup> implementation of comprehensive workplace health program design,<sup>37,38</sup> and redesign of poorly performing programs.<sup>39</sup>

Furthermore, a practical means of evaluating such programs is needed. Whereas the initial design of programs should be based on best available levels of evidence of effectiveness, the day-to-day implementation of such programs needs to be supported by easy-to-use metrics and pragmatic evaluations that may be carried out by non-expert staff. To that end, a practice-based system to support implementation with key design indicators and a metric to track impact has been introduced and deployed in areas of PA,<sup>40</sup> diabetes prevention,<sup>41,42</sup> obesity,<sup>43</sup> and worksite health promotion.<sup>37,44</sup> The four key design indicators represent: 1) the need for an interventional effect size to be worthwhile of the effort; 2) a scope of services to be defined so as to ensure the ability to estimate program costs and necessary implementation resources; 3) scalability to reach the entire population of interest; and 4) sustainability to continue the program implementation until benefits are experienced and the value of the program is achieved.<sup>40</sup> This set of key program design factors interacts through feedback loops and other integrated processes with a set of evaluation indicators. These indicators include: 1) penetration in the audience of choice; 2) implementation of the planned intervention; 3) participation of individuals into the program; and 4) effectiveness at the individual level (*i.e.*, the proportion of successes that are created as a result of the program). Each of these indicators is represented as a proportion with an *a priori* defined numerator and denominator and the product of this set of indicators is referred to as the PIPE Impact Metric.<sup>40</sup> Examples of studies in which the PIPE Impact Metrics has been generated as a result of this type of evaluation include a PA program called the HealthPartners 10,000 Steps® program as implemented for a defined population of members with diabetes<sup>40</sup>

**Table 2**  
Best practice design principles to increase movement and reduce sedentary behavior.

Design principles	Explanation	Best practice examples
<i>Leadership</i>	Elements that reflect program vision, organizational policy, resources, and implementation support	A clearly defined strategic business plan for the creation of a culture of health and well-being with assigned executive-level accountability
<i>Relevance</i>	Elements that address factors critical to program participation and connecting to the intrinsic motivations of workers	Use of behavioral economics to make healthy and active choices the easy choices; make programs easily accessible; use multiple methods of program delivery; inclusion of family
<i>Partnership</i>	Elements that relate to integration efforts with other groups or entities such as unions, other internal departments, external vendors, community organizations, among others	Ensure worker representation in programmatic decisions; use of participatory practices; connect the program to community resources that may be accessed outside of work hours
<i>Comprehensiveness</i>	The five components as defined by <i>Healthy People 2010</i> , that create a comprehensive program: health education, supportive physical and social environments, integration of the worksite program into the organization's structure, linkage to related programs, and worksite screening programs	Use assessments of health risks with feedback; deploy organizational policy solutions to affect physical and psychosocial environmental changes (e.g., sit-stand workstation policy, physical activity breaks)
<i>Implementation</i>	Elements that ensure a planned, coordinated and fully executed work plan and process tracking system	Documented quarterly implementation plans with annual roll-ups; ensure all planned activities are implemented and tracked
<i>Engagement</i>	Elements that promote ongoing connections between employees and the program through activities and behaviors that build trust, respect, and an overall culture of health and well-being	Meaningful and relevant incentives that optimize participation in activity programs but do not jeopardize internal motivation; clearly defined expectations related to respectful behavior at the workplace
<i>Communications</i>	Elements that reflect a strategic communications plan that maintains high program visibility and recognition	Build a program brand under which physical activity can become a recognized activity; ensure year-round visibility and focus on the active workplace and reduce prolonged sedentary behavior
<i>Being data-driven</i>	Elements that ensure program measurement, reporting, evaluation, and continuous improvement	Use a defined measurement strategy to monitor progress and report to management; use evaluation data for improvement
<i>Compliance</i>	Elements that ensure the program meets regulatory and ethical requirements and protect the personal information of employees and participants	Ensure meeting ergonomic and safety standards; ensure meeting regulatory requirements (e.g., HIPAA, ADA, GINA, EEOC, etc.)

HIPAA = Health Insurance Portability and Accountability Act; ADA = Americans with Disability Act; GINA = Genetic Information Nondiscrimination Act; EEOC = Equal Employment Opportunity Commission.

and the 8-year experience of a comprehensive worksite health promotion program in Finland.<sup>44</sup>

In summary, there is a clear sense of need and a set of suggestions for a deliberate strategy to be created that will enable the successful

promotion of movement and reduction of SB at the workplace. This strategy includes a business plan and rationale, an organizing framework, the prioritization of intervention that are known to generate outcomes, and the alignment of programmatic solutions with strong program design principles.<sup>31</sup>

### Strategies to increase movement, PA and reduce SB

Based on the available evidence of effectiveness,<sup>2,10,29,30</sup> a number of interventions and programmatic options have been identified that increase PA and reduce SB. Due to their variety, these options are categorized according to a social ecological framework with four broad levels - Individual, community, the communication environment (including information technology), and the physical environment and policy. The workplace is an example of a community setting that cross-cuts these four broad levels as the evidence of effective strategies and tactics is considered.

The 2018 Physical Activity Guidelines Advisory Committee Scientific Report identifies successful examples to increase movement and reduce SB in the workplace setting.<sup>2,45</sup> Effective strategies to increase PA at the various levels of the socioecological model are presented and the worksite is highlighted related to the reduction of SB.<sup>45</sup> Similarly, the scientific background paper for the National Physical Activity Plan included a review of studies promoting PA and also organized the evidence into an ecological framework—however, it organized explicitly in the context of the workplace and the interests of the business and industry sector.<sup>30</sup> Taken together, these resources present many evidence-informed approaches that may be implemented at the workplace. Along with several other reviews on the topic, Table 3 presents a set of evidence-based intervention options that may be provided at the workplace.<sup>10,29–31,45</sup>

As noted in Table 3, there are quite a few programmatic options available that we know work. However, these programmatic options reflect a level of confidence that they are effective in increasing movement and reducing SB. That, in itself, may not be sufficient to persuade a corporate manager of decision-maker to invest in such options. Interventions should also be effective in improving business outcomes as presented in the second column of Table 1. Not all studies summarized in the 2018 Physical Activity Guidelines Advisory Committee Scientific Report<sup>2,44</sup> include business outcomes, *per sé*. Studies such as the Take-a-Stand Project,<sup>46</sup> which utilized a sit-stand intervention among call center employees, show reductions in sitting time of over 1 h per day but also reported improvements in health outcomes (e.g., reduced upper back and neck pain) and improved mood states (e.g., reductions in fatigue, confusion, and total mood disturbance) which, in turn, impact on lower sickness absence, productivity, and business performance. Another trial from Australia corroborated the results of the Take-a-Stand Project in terms of reductions in sitting time and back pain and also reported improvements in presenteeism and frequency of errors.<sup>47</sup> Therefore, whereas increased movement and reduced sedentary behavior are necessary outcomes of the proposed interventions, they are not sufficient in their own right. In addition, important indicators of workplace business performance must be featured as well.

### Barriers

Interrupting prolonged sedentary time (*i.e.*, more than 60 min periods) reaps benefits to health and function.<sup>48</sup> However, at the individual and organizational levels many barriers exist to effectively and efficiently do so. It is important to call out barriers in an effort to circumvent such problems and be prepared to address them successfully in the implementation plans.

A recent study addressed this concern by focusing on the practicality of interventions designed to reduce SB in the workplace.<sup>49</sup> The researchers studied the practice-based realities of intentionally interrupting sitting time every 30 min with a 2–3 min moderate intensity PA. Using inductive thematic analysis, they identified themes that

**Table 3**

Intervention strategies to increase movement and reduce sedentary behavior in the workplace according to socioecological levels.

Socioecological level	Subcategories	Intervention or programmatic option
Individual	Behavior change theories and models	<ul style="list-style-type: none"> <li>• Incentives (e.g., lottery)</li> <li>• Individual face-to-face counseling to increase PA levels</li> <li>• Sit-stand workstations</li> <li>• PA breaks</li> <li>• Treadmill workstations</li> <li>• Stairwell walking</li> <li>• Skip-stop elevators</li> </ul>
Group-based	Behavior change theories and models	<ul style="list-style-type: none"> <li>• Integrate 10-min exercise breaks into daily routines conducted individually or in a group setting</li> <li>• PA breaks</li> <li>• Incentive-based online PA intervention using a team-based format</li> <li>• Light physical exercise interventions (resistance training and guidance) focused on headache, neck, and shoulder symptoms</li> <li>• Health fairs and worksite-wide events that include biometric and behavioral self-assessments with feedback</li> <li>• Walking groups and buddy systems to create supportive social networks at work</li> <li>• Facilities and signs aimed at helping workers meet recommended levels of PA (point-of-decision prompts)</li> <li>• Implementation of an all-employee health assessment or health risk appraisal including PA assessment and feedback integrated with educational outreach and follow-up</li> </ul>
Communication environment	<ul style="list-style-type: none"> <li>• Web-based or Internet-delivered interventions</li> <li>• Tailored or targeted communications materials</li> <li>• Telephone-assisted interventions</li> <li>• Wearable activity monitors</li> </ul>	<ul style="list-style-type: none"> <li>• Printed motivationally-tailored PA intervention materials</li> <li>• Standard and motivationally--tailored Internet-based messages to promote PA (prompting software)</li> <li>• E-mail intervention using messaging to promote PA</li> <li>• Internet-based counseling for PA, nutrition and weight management</li> <li>• Telephone-based coaching or counseling for PA change</li> <li>• Use pedometers to increase PA</li> <li>• Informational outreach activities and campaigns to promote PA</li> <li>• Provide secure parking for bicycles</li> <li>• Install showers and changing rooms for workers' use</li> <li>• Advocate and support the introduction and passage of legislation that supports active commuting to work</li> <li>• Provide tax breaks for companies that implement comprehensive worksite health promotion programs</li> <li>• Provide onsite fitness facilities and/or a PA-friendly campus, including the distribution of walking maps and easy access to walking/running routes</li> <li>• Companies participate in community-based worksite exercise competitions</li> <li>• Community-wide PA campaigns</li> <li>• Sit-stand workstations</li> </ul>
Physical environment and policy	<ul style="list-style-type: none"> <li>• Point-of-decision prompts</li> <li>• Support for active transport</li> <li>• Tax policy</li> </ul>	<ul style="list-style-type: none"> <li>• Provide secure parking for bicycles</li> <li>• Install showers and changing rooms for workers' use</li> <li>• Advocate and support the introduction and passage of legislation that supports active commuting to work</li> <li>• Provide tax breaks for companies that implement comprehensive worksite health promotion programs</li> <li>• Provide onsite fitness facilities and/or a PA-friendly campus, including the distribution of walking maps and easy access to walking/running routes</li> <li>• Companies participate in community-based worksite exercise competitions</li> <li>• Community-wide PA campaigns</li> <li>• Sit-stand workstations</li> </ul>

Note: PA = physical activity.

elucidated the barriers to breaking up prolonged sitting time as experienced by the study subjects. They subsequently ordered the themes into three levels—first order, second order, and third order themes—from micro to *meso* to macro, respectively. The third order (macro) theme of “workplace culture” included the second order (meso) themes of pressure to constantly be working, lack of support from the employer, and normative workplace behavior which, in turn, were broken out into the first order (micro) themes of feeling judged by colleagues about taking time away from work, internal pressure to be at the desk, not normal office behavior, distraction for others, and feeling uncomfortable performing activity breaks. Another second order theme referred to “the reduction in work productivity” which was broken out into first order themes of loss of productivity and loss of focus or concentration on work tasks. The next second order theme of “specific work tasks” included first order themes related to the priority of deadlines, meetings or teaching, and dealing with people. Finally, a last second order theme referred to as “lack of knowledge and confidence” broke out into first order themes including lack of awareness of need to perform activity breaks, not feeling immediate effects of the activity, and lack of confidence to change behavior. Barriers to addressing the need for movement at the workplace should be included in the design characteristics and implementation plans of the interventions and be regularly reviewed as an integral part of the feedback mechanisms that include ongoing evaluations.<sup>40</sup>

## Conclusions

Since the late 1600's, observations of the ill-health effects of SB at work and the lack of regular PA were reported by Bernardo Ramazzini, an Italian physician who is widely recognized as the father of industrial medicine.<sup>49</sup> In 1700, he published his *Diseases of Workmen (De Morbis Arificum Diatribe)*, a text that later became the foundation of the occupational medicine discipline,<sup>50</sup> and in which he advised sedentary workers to “take to physical exercise at any rate on holidays” to counteract the harm done by many days of sedentary life. Today, the negative impact of sedentary behavior and lack of movement on health outcomes—physical, mental, social, and economic—are recognized at both the individual and organizational levels. As a result, it makes good business sense to intentionally counteract prolonged periods of sedentary work and inactivity with movement breaks. This paper has outlined both the principles according to which programs should be designed in order to generate levels of confidence that these solutions will prove effective and sustainable as well as the examples of programmatic solutions that may aid in doing so. Continued research and leadership from business and public health are needed to ensure that the evidence of effectiveness, creation of shared value, and mobilization of resources are aligned so as to reap the benefits of movement, PA, CRF, and reductions in prolonged SB for individual workers, the companies they work for, and society at large.

## Author disclosure

I have nothing to disclose.

## Declaration of Competing Interest

None.

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