



ELSEVIER

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Physical activity promotion as a strategic corporate priority to improve worker health and business performance

Nicolaas P. Pronk^{a,b,c,*}, Thomas E. Kottke^{a,b,c,d}

^a JourneyWell, Minneapolis, MN, USA

^b HealthPartners, Minneapolis, MN, USA

^c HealthPartners Research Foundation, Minneapolis, MN, USA

^d Department of Medicine, University of Minnesota, Minneapolis, MN, USA

ARTICLE INFO

Available online 6 July 2009

Keywords:

Physical activity
Worksite
Employee health
Business performance

ABSTRACT

Background. The increasingly sedentary nature of work and its impact on health and productivity indicators demands the promotion of physical activity at the worksite.

Purpose. This paper aims to present considerations for broad-scale application of corporate strategies designed to promote physical activity among employees and their families through employer-sponsored initiatives.

Approach. The benefits of physical activity are multifold, including health and wellbeing and productivity related outcomes. The workplace setting may be leveraged to promote physical activity levels through frequent and sustained exposures to effective interventions that reach employees and, indirectly, their families. Furthermore, employers represent a powerful stakeholder group that should leverage its influence on health policy initiatives designed to create supportive environments inside the workplace as well as the broader community. Specific principles, recommendations for action, and considerations for the prioritization of initiatives are provided based on essential elements for comprehensive programs and health policy initiatives and in the context of a social-ecological model and supportive research.

Conclusions. Physical activity promotion at the worksite should be an integrated initiative that measurably improves worker health and enhances business performance.

© 2009 Elsevier Inc. All rights reserved.

Introduction

The human body is designed for physical work. The muscle mass of humans is equivalent to more than half of total body weight, designed to carry the body around and for doing muscular work. Human physiological functions involve rhythmic, dynamic activity, interspersed with periods of relaxation (Rodahl, 1989). Departure from repeated cycles of rhythmic contraction and relaxation may predispose an individual to pain, disabling conditions, and musculoskeletal complaints that, in the work setting, may lead to injury, varying degrees of disability, absenteeism, reduced overall job performance, or other undesirable outcomes. Even when work processes and ergonomic job requirements are improved, static tension and limited mobility remain major predictors for musculoskeletal problems, pain, sick leave, and ill-health effects (Berqvist, 1995).

The increasingly sedentary nature of many jobs and work tasks is characteristic of the contemporary workplace. A need to counteract the changing nature of work and to support promotion of physical

activity at the worksite is evident. It is the purpose of this paper to comment on considerations for broad-scale application of strategies designed to promote, adopt, and sustain increased levels of physical activity in the context of the workplace setting.

Benefits of physical activity

The overall benefits of physical activity behavior are well-documented. Very strong scientific evidence based on a large number of well-designed studies indicates that physically active people have higher levels of health-related fitness, lower risk profiles for the development of numerous medical conditions, and lower rates of chronic disease as compared to their less active counterparts (Physical Activity Guidelines Advisory Committee, 2008). Physically active adult men and women have lower rates of all-cause mortality, coronary heart disease, stroke, type 2 diabetes, colon cancer, breast cancer, depression, high blood pressure, and metabolic syndrome. In addition, physically active adults also have a body mass, body composition, and a biomarker profile that resist the development of cardiovascular disease and type 2 diabetes. There is evidence that sleep quality and overall health-related quality of life are higher among physically active adults as well.

* Corresponding author. JourneyWell, HealthPartners, Mail Stop 21111H, P.O. Box 1309, 8170 33rd Avenue South, Minneapolis, MN 55440-1309, USA. Fax: +1 952 967 6710.

E-mail address: Nico.p.pronk@healthpartners.com (N.P. Pronk).

The roles of physical activity and cardiorespiratory fitness have also been considered in the context of workplace productivity and medical care expenses. Although the relationship between physical activity on productivity indicators remains inconclusive, emerging evidence indicates positive effects of physical activity on work performance, fitness program participation on absenteeism, and vigorous physical activity on sick leave (Proper and van Mechelen 2008). Furthermore, from an employers' perspective, low levels of physical activity and cardiorespiratory fitness are independent contributors to higher medical care expenditures (Pronk et al., 1999; Anderson et al., 2000).

The workplace as a physical activity intervention setting

Through the workplace, it is possible to influence the health behaviors of a significant proportion of employed adults and their families. Since employees represent an audience with whom the employer can engage in an ongoing and extended dialogue around health-related issues, the potential to generate sufficient reach and frequency of exposure to effective interventions into the population is high. Physical activity programs should be population-based. Targeted or tailored strategies should be considered in order to reach those who are in highest need for physical activity based on the fact that moving away from sedentary behavior produces major health benefits (Physical Activity Guidelines Advisory Committee, 2008).

The corporate setting also provides a vast array of tools, vehicles, and resources that may be mobilized to increase awareness of the role of physical activity, support the adoption and maintenance of physical activity routines, and institute a supportive physical and cultural environment for physical activity. Examples include online programs, phone-based interventions, departmental team meetings, organized labor meetings, annual planning, e-mail communications, stairwell signage, corporate policies, health insurance benefits—just to name a few.

Corporate promotion of physical activity may also benefit greatly from community-based, state-specific, and national legislative action, public health law, or health policy initiatives. In fact, corporations should actively participate and shape such initiatives as part of their strategic corporate health and business agenda. This may be accomplished through collaboratives and coalition action by such entities such as the local Chamber of Commerce, regional or national employer coalitions, or other business and health initiatives.

Principles and recommendations for action

Several criteria have proven relevant in terms of implementation of employer-sponsored programs and have influenced the decision-making of employers to invest in health enhancing initiatives. We present these criteria as a set of principles for action.

Principle 1

Organizing physical activity interventions within a framework that leverages the inter-relationships of individuals and their work environment. To support principle 1, we recommend use of a social-ecological model (McLeroy et al., 1988), which would allow for the conceptualization of interventions at multiple levels of influence—individual, inter-individual, organizational and environmental. All levels are inter-related and have, singly and in combination, an important relationship to the overall level of physical activity and, by extension, the productivity of the worker.

Principle 2

Prioritizing the use of evidence-based and evidence-informed interventions. Interventions should at a minimum be able to show

that their design is evidence-informed and couched in the context of practice realities (Kottke and Pronk 2006). The ability of interventions to generate meaningful effect sizes is paramount to documenting health-related outcomes and economic (medical and productivity) impact. Principle 2 supports recommendations for program designs that are informed by a body of research that also includes “promising practices”.

Principle 3

Aligning selected physical activity interventions with best practices for comprehensive worksite health promotion programs. The process used to plan and implement physical activity programs needs to be sensitive, relevant, and responsive to employee interests, group needs, and corporate realities. Principle 3 provides the opportunity to implement physical activity promotions at the workplace as part of a larger set of program elements that collectively represent a best practices approach. Several collaborating groups have introduced “best practices” for worksite health promotion programs with numerous elements overlapping. Comprehensive practices take both the physical and organizational work environment into account while simultaneously addressing the personal health needs of the individual employees and their families. Evidence suggests that an integrated strategy is more effective in preventing disease and promoting health and safety than addressing each of the components separately (Sorenson and Quintiliani, 2009). The National Institute for Occupational Safety and Health has explicitly recognized the synergistic effect of this approach in its list of essential elements of effective workplace programs and policies for improving worker health and wellbeing (National Institute for Occupational Safety and Health, 2008). In Table 1 we present a set of literature-derived recommended strategies to promote physical activity that are based on the principles outlined above and include examples of health policy or legislative action.

Proof of concept

To illustrate how the proposed principles described above and recommendations presented in Table 1 may be applied, two case studies were selected from the literature. First, Pronk, et al. (1995) reported on a company-wide physical activity program implementation designed to address concerns around cumulative trauma disorders, low back pain, mood states, and occupational stress. At the Westinghouse Electronic Assembly Plant in College Station, Texas, a protocol was developed and implemented around a series of flexibility and stretching exercises. This protocol involved the inclusion of all plant workers in daily 10-minute supervised exercise sessions. Managers and other leaders supported the implementation with their respective teams and the plant leadership allowed the exercises to be conducted on company time. Despite the non-compulsory nature of the program, daily employee participation ranged between 97% and 100% and results indicated significant improvements in wrists and low back flexibility indicators, fatigue, anger, depression, and total mood disturbance. The program included individual-level interventions, team-based implementations and co-worker support, organizational-level changes to allow for company time to be used for the program, and several changes in the work environment to facilitate a daily 10-minute assembly belt stoppage, a raised platform and a sound system to support visual and verbal instruction.

The second case study is a more recent example which describes the impact of a preseason work task-specific fitness program and improved nutritional practices on productivity and injury rates among reforestation workers in western Canada. Roberts (2009), reports on a training protocol designed based on sport science principles that included aerobic and resistance training and was implemented 8 weeks prior to the

Table 1

Recommendations for action to promote physical activity at the workplace in the context of best practice elements and health policy initiatives.

	Recommendations for action to support the adoption and integration of physical activity strategies at the workplace	Social–ecological domain addressed	Supportive literature
<i>Essential elements for effective workplace programs and policies^a</i>			
Develop a “human centered culture” ^b	Organizations should adopt programs and policies that promote respect, embrace diversity, engage workers, develop trust, and optimize a culture that improves health and productivity through inclusion of physical activity strategies.	Individual Inter-individual Organizational Environmental	Campbell M, et al. Effects of a tailored health promotion program for female blue-collar workers: health works for women. <i>Prev Med</i> 2002;34:313–323. Yancey AK, et al. The Los Angeles lift off: a sociocultural environmental change intervention to integrate physical activity into the workplace. <i>Prev Med</i> 2004;38:848–856.
Demonstrate leadership ^b	Executives, mid-level management and front-line leaders should all exhibit, in both words and actions, support for an active lifestyle. Incorporating physical activity objectives into the overall health and wellness program and linking it to business objectives is an important step.	Organizational	Quintiliani L, et al. The workplace as a setting for interventions to improve diet and promote physical activity. World Health Organization. Geneva, Switzerland, 2008.
Engage mid-level management ^b	Mid-level supervisors and managers are central to spreading the program throughout the company. They should integrate the physical activity program into daily operations and motivate and communicate with employees to optimize participation.	Organizational	Pronk SJ, et al. Impact of a daily 10-minute strength and flexibility program in a manufacturing plant. <i>Am J Health Promot</i> , 1995;9:175–178.
Establish clear principles ^c	Clear principles focus priorities, guide program design, and direct resource allocations. Companies should apply clear principles that can direct necessary resources to physical activity strategies.	Organizational Environmental	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
Integrate relevant systems ^c	Integrated systems address coordination of separately managed programs and services and can optimize the impact and effectiveness of physical activity programs across a variety of outcomes. For example, companies can promote the implementation of online physical activity programs, walking programs, and integrated work breaks to address both overall health improvement as well as specific injury reduction targets.	Individual Inter-individual	Taylor W. Transforming work breaks to promote health. <i>Am J Prev Med</i> 2005;29:461–465.
		Organizational Environmental	Pronk SJ, et al. Impact of a daily 10-minute strength and flexibility program in a manufacturing plant. <i>Am J Health Promot</i> , 1995;9:175–178. VanWormer JJ, et al. Experience analysis of a practice-based, online pedometer program. <i>Diab Spectrum</i> , 2006;4:197–200. Herman CW, et al. Effectiveness of an incentive-based online physical activity intervention on employee health status. <i>J Occup Environ Med</i> 2006;48:889–895.
Eliminate recognized occupational hazards ^c	Companies should create safe places for physical activity at work. For example, ensuring well-lit and safe stairwells when promoting the use of stairs or eliminating the exposure to toxic fumes prior to introduction of a physical activity program.	Organizational Environmental	Hammond SL, et al. The Centers for Disease Control and Prevention Director’s Physical Activity Challenge: an evaluation of a worksite health promotion intervention. <i>Am J Health Promot</i> 2000;15:17–20. Institute of Medicine, Committee to Assess Training Needs for Occupational Safety and Health Personnel in the United States. Safe work in the 21st century: education and training needs for the next decade’s occupational safety and health personnel. Washington, DC, National Academies Press, 2000. Institute of Medicine, Committee to Assess Training Needs for Occupational Safety and Health Personnel in the United States. Safe work in the 21st century: education and training needs for the next decade’s occupational safety and health personnel. Washington, DC, National Academies Press, 2000.
Be consistent ^c	Companies should apply principles to create a work environment that consistently supports health. The organization should support physical activity opportunities in the physical and cultural work environments.	Organizational Environmental	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
Promote employee participation ^c	Employee participation should be promoted in all aspects of the program, including the development, implementation, and evaluation. Physical activity program participation should be connected to meaningful incentives and awards.	Individual Inter-individual Organizational	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005. Thygeson NM, Gallagher J, Cross K, Pronk NP. Employee health at BAE Systems: an employer–health plan partnership approach. In: Pronk NP (Editor). ACSM’s Worksite Health Handbook, <i>Second Edition</i> . A Guide to Building Healthy and Productive Companies. Human Kinetics, Champaign, IL. 2009.

Table 1 (continued)

	Recommendations for action to support the adoption and integration of physical activity strategies at the workplace	Social–ecological domain addressed	Supportive literature
Tailor programs to the specific workplace ^c	Workplaces vary in size, sector, product, worker characteristics, and needs, among others. Companies should recognize this diversity and apply that knowledge when designing physical activity programming.	Individual Inter-individual Organizational	Sorenson G, et al. Promoting behavior change among working-class, multiethnic workers: results of the Healthy Directions—Small Business Study. <i>Am J Public Health</i> 2005;95:1389–1395.
Consider incentives and awards ^c	Companies should provide integrated and meaningful incentives that can generate high levels of participation in health assessments and physical activity programs, year after year. Incentives should align with the corporate culture and cultivate internal motivation for health improvement.	Individual Inter-individual Organizational	VanWormer JJ, Pronk NP. Rewarding change: Principles for implementing worksite-level incentive programs. In: Pronk NP (Editor). <i>ACSM's Worksite Health Handbook, Second Edition. A Guide to Building Healthy and Productive Companies</i> . Human Kinetics, Champaign, IL, 2009.
Find and use the right tools ^c	A health assessment survey should be used to assess population level physical activity and provide immediate feedback on physical activity to the individual.	Individual Organizational	A systematic review of selected interventions for worksite health promotion: the assessment of health risks with feedback. Task Force on Community Preventive Services, 2008. (www.thecommunityguide.org).
Adjust the program as needed ^c	Integrated evaluation allows for data-driven improvements over time. Physical activity programs should be evaluated for reach, implementation efficiency, effectiveness, participation, and direct and indirect financial outcomes.	Individual Inter-individual Organizational Environmental	Glasgow, RE, et al. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. <i>Am J Public Health</i> 1999;89:1322–1327. Pronk NP. Designing and evaluating health promotion programs: simple rules for a complex issue. <i>Disease Management and Health Outcomes</i> 2003;11:149–157.
Make sure the program lasts ^c	Sustainability should be a central design feature and the overall program needs to clearly be aligned with the core products and values of the organization.	Individual Inter-individual Organizational Environmental	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
Ensure confidentiality ^c	Compliance with regulatory requirements (e.g., HIPAA, State laws, ADA) is paramount. The company should ensure that the confidentiality personal health information, including physical activity data, is safeguarded.	Individual Inter-individual Organizational	Earles AC, Heinen L. Employee health promotion: A legal perspective. In: Pronk NP (Editor). <i>ACSM's Worksite Health Handbook, Second Edition. A Guide to Building Healthy and Productive Companies</i> . Human Kinetics, Champaign, IL, 2009.
Be willing to start small and scale up ^d	Company should be strategic in the implementation of the overall program. Employees may need time to learn about the program and understand its role within the company culture. Unions may need time to come on-board and actively support the program. The organization should consider the initiation of physical activity pilot projects prior to company-wide rollouts when unsure about program characteristics or outcomes.	Individual Inter-individual Organizational Environmental	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
Provide adequate resources ^d	The company should ensure proper implementation through the mobilization of appropriate resources including time, money and people.	Organizational	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
Communicate strategically ^d	The company should communicate effectively with staff on physical activity programs including broad dissemination of program messages as well tailored communications to those who are identified as high-risk employees.	Individual Inter-individual Organizational	Marcus BH, et al. Evaluation of motivationally tailored vs. standard self-help physical activity interventions at the workplace. <i>Am J Health Promot</i> 1998;12:246–253.
Build accountability into program implementation ^d	Accountability reflects leadership commitment and should be an integral component of the company culture.	Inter-individual Organizational	Quintiliani L, et al. The workplace as a setting for interventions to improve diet and promote physical activity. World Health Organization. Geneva, Switzerland, 2008.
Measure and analyze ^e	The organization should conduct evaluations that use the most appropriate methods to focus on the right objectives.	Organizational	Pronk NP. The four faces of measurement. <i>ACSM's Health & Fitness Journal</i> 2005;9:34–36.
Learn from experience ^e	The use of continuous quality improvement methods should be applied to improve the program.	Individual Inter-individual Organizational	Institute of Medicine, Committee to Assess Worksite Preventive Health Program Needs for NASA Employees. Food and Nutrition Board. Integrating employee health: a model program for NASA. Washington, DC, National Academies Press, 2005.
<i>Examples of health policy initiatives^f</i>			
Worksite-specific policies related to physical activity	Worksite policies are promising factors for physical activity interventions. Organizations should consider how to use this strategy for physical activity promotion.	Organizational Environmental	Lucove JC. Worker's perception about worksite policies and environments and their association with leisure-time physical activity. <i>Am J Health Promot</i> 2007;21:196–200. Dodson EA, et al. Worksite polices and environments supporting physical activity in Midwestern communities. <i>Am J Health Promot</i> 2008;23:51–55.
Tax breaks for companies who implement comprehensive worksite health promotion programs	Physical activity programs represent on component of comprehensive programs. Tax incentives may support the investment in worksite-based physical activity programs. Companies should actively support this type of legislation through employer coalitions and Chamber of Commerce initiatives.	Organizational Environmental	The Healthy Workforce Act introduced in the Senate by Senators Tom Harkin (D-IA) and Gordon Smith (R-OR) on July 9, 2007. (see http://healthpromotionadvocates.org/legislative_priorities.htm ; accessed 11/3/08).

(continued on next page)

Table 1 (continued)

	Recommendations for action to support the adoption and integration of physical activity strategies at the workplace	Social–ecological domain addressed	Supportive literature
Promotion of active commuting	Companies should advocate and support the introduction and passage of legislation that supports active commuting to work.	Organizational Environmental	The Bicycle Commuter Act: the bike commuter tax benefit has passed both House and Senate and President Bush signed the legislation into law. (see: http://www.vabike.org/bike-commuter-tax-benefit-passes-both-house-senate/ ; Accessed 11/3/08). Vuori IM, et al. Physically active commuting to work—testing its potential for exercise promotion. <i>Med Sci Sports Exerc</i> 1994;26:844–850.

^a For definitions of each of the essential elements, see the NIOSH WorkLife Initiative (see www.cdc.gov/niosh/worklife/essential.html).

^b Organizational culture and leadership dimension elements.

^c Program design dimension elements.

^d Program implementation and resources dimension elements.

^e Program evaluation dimension elements.

^f Health policy examples provided here are not part of the NIOSH WorkLife Initiative list of essential elements.

planting season. Following a pilot study implemented among workers of two small silviculture contractor companies and their licensee, Weyerhaeuser Company, the “Fit to Plant” program was created and became a requirement for contracting with Weyerhaeuser Company. Results included a significant increase in cardiorespiratory fitness, productivity, no slowing of planting rate in the afternoon, enhanced hand agility, and fewer injury and illness incidents. Over 5 years of implementation of the program by all Weyerhaeuser Company silviculture contractors, injury rates among tree planters have been reduced from 22% to less than 5%. The “Fit to Plant” program deployed the social–ecological model by intervening with an individual-level fitness intervention, group-based presentations and distribution of materials pre-planting season meetings, an organizational-level contracting policy to broadly implement the program, and a change in the work environment that required contractors to offer the program to planters at the time of hiring.

Both examples deploy strategies and tactics that support individual efforts through supportive protocols, policies, and environments. In effect, they make physically active behavior the default choice and thereby make decisions to engage in sedentary or less physically active behavior increasingly difficult.

Prioritization considerations

Prioritization of initiatives to promote physical activity at the corporate level will need to consider resource availability, the proportion of the population that will be reached with the intervention, population readiness, timing in the context of other initiatives, and corporate readiness to act. Prioritization should be preceded by a planning initiative in order to align program components with various phases of implementation. Considering the importance of a culture that is prepared for and open to receive a given intervention, starting out with an organizational-level assessment of physical activity issues related to the worksite (Oldenburg et al., 2002) and a process that addresses any conflicting organizational policies seems logical and intuitive. Individual-level solutions are more likely to generate success in the context of supportive environments.

Conclusions

To counteract the increasingly sedentary nature of work and its unintended consequences on health and productivity, corporations should consider how to integrate physical activity promotion into their overall business planning process. The workplace represents a unique environment in which physical activity promotion initiatives can repeatedly reach a large number of people over an extended period of time, thereby optimizing the likelihood for successful

outcomes. Workplace physical activity programs have been shown to be successful in improving health and productivity outcomes. To stimulate appropriate action, companies should consider physical activity promotion a strategic business imperative and the following recommendations should be considered:

- Physical activity programs should be implemented population-wide with targeted strategies to reach sub-populations where necessary. This will ensure reaching everyone in the target population and allows for tailored or targeted solutions to reach those who experience disparities in physical activity behavior.
- Physical activity programs with proven effectiveness should be prioritized for implementation. However, due to the need for tailoring to the local situation, promising practices should be given ample attention and consideration.
- Physical activity programs should be integrated into an overall best practice approach to worksite health promotion that allows essential program elements to be leveraged toward successful outcomes.
- Physical activity programs should be implemented in the context of a supportive environment, which favors consideration for concurrent implementation of individual-, organizational-, and environmental-level strategies.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

References

- Anderson, D.R., Whitmer, R.W., Goetzel, R.Z., et al., 2000. The relationship between modifiable health risks and group-level health care expenditures. *Am. J. Health Promot.* 15, 45–52.
- Berqvist, U., 1995. *Musculoskeletal Disorders and the Workplace: Low Back and Upper Extremities*. National Academies Press, Washington, DC, USA.
- Kottke, T.E., Pronk, N.P., 2006. Physical activity: optimizing practice through research. *Am. J. Prev. Med.* 31, S8–S10.
- McLeroy, K., Bibeau, D., Steckler, A., et al., 1988. An ecological perspective on health promotion programs. *Health Educ. Quart.* 15, 351–377.
- National Institute for Occupational Safety and Health (NIOSH) 2008. *WorkLife Initiative. Essential elements of effective workplace programs and policies for improving worker health and wellbeing*. Available on www.cdc.gov/niosh/worklife. (Accessed 11/1/2008).
- Oldenburg, B., Sallis, J.F., Harris, D., et al., 2002. Checklist of health promotion environments at worksite (CHEW): development and measurement characteristics. *Am. J. Health Promot.* 16, 288–299.
- Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report*, 2008. Washington, DC: U.S. Department of Health and Human Services, 2008.
- Pronk, S.J., Pronk, N.P., Sisco, A., et al., 1995. Impact of a daily 10-minute strength and flexibility program in a manufacturing plant. *Am. J. Health Promot.* 9, 175–178.
- Pronk, N.P., Tan, A.W., O'Connor, P., 1999. Obesity, fitness, willingness to communicate and health care costs. *Med. Sci. Sports Exerc.* 31, 1535–1543.
- Proper, K., van Mechelen, W., Effectiveness and economic impact of worksite interventions to promote physical activity and healthy diet. *World Health*

- Organization, 2008. (See: http://www.who.int/dietphysicalactivity/Proper_K.pdf. Accessed 11/7/08).
- Roberts, D.B., 2009. The occupational athlete. Injury reduction and productivity enhancement in reforestation workers. In: Pronk, NP (Ed.), *ACSM's Worksite Health Handbook, Second Edition. A Guide to Building Healthy and Productive Companies*. Human Kinetics, Champaign, IL.
- Rodahl, K., 1989. *The Physiology of Work*. Taylor and Francis, Inc., Bristol, PA, USA.
- Sorenson, G., Quintiliani, L., 2009. Effective programs to promote worker health within healthy and safe worksites. In: Pronk, NP (Ed.), *ACSM's Worksite Health Handbook, Second Edition. A Guide to Building Healthy and Productive Companies*. Human Kinetics, Champaign, IL.