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## POINT OF VIEW

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# Promoting physical activity: the new imperative for public health

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### Abstract

The aim of this essay is to provide an overview of initiatives designed to increase physical activity among different populations and in different settings, and to set the context for the major challenges that lie ahead. The decline in habitual physical activity with modernization, and the causal link between physical activity and health are briefly reviewed. The need to understand physical activity as a health behavior and examples of behavior change theories that have been applied to the promotion of physical activity are discussed. Diverse projects and campaigns in three countries, i.e. South Africa, Australia and the US, are highlighted. Common themes found in these physical activity initiatives include the development of a theory-driven research base, inclusion of behavioral and social scientists on multidisciplinary teams, and advocacy for environmental changes that promote physical activity. Within the next decade, research projects and national campaigns such as those described herein will yield important

new findings on how to increase physical activity levels among targeted sectors of the population. The research agenda for the future includes development of both basic and applied research on physical activity, and the integration of theory across social, behavioral and biomedical disciplines.

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### Introduction

The human species was designed for movement. Until the mid-19th century, humans lived as gatherers, scavengers, toolmakers, hunters, farmers and artisans. For 99.9% of human history, physical demands were typical of daily life and an expected part of the everyday world (Astrand, 1986). Our species not only survived but flourished for several thousand generations prior to the advent of the automobile, television, video games and the Internet. Within only a few generations, the physical activity demands of work, domestic chores and leisure time have decreased so dramatically as to be nearly non-existent in industrialized and urbanized environments.

However, it has also become increasingly clear that many of the chronic diseases we face today are associated fundamentally with the pervasive sedentariness of modern life. A case can be made that habitual physical activity has a biological basis with a central control, and that physical inactivity disturbs normal function and contributes to chronic energy imbalance (Rowland, 1998). This is not a plea to return to the physical toil that our ancestors

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endured. Rather, it is a reminder that that our bodies have an inherent need to be exercised. If our overall health and functioning are to be optimized, we need to be physically active on a regular basis.

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### **The link between physical activity and health**

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In recent years the public health benefits of reducing sedentary lifestyles and promoting physical activity have become increasingly apparent. *Physical Activity and Health: A Report of the Surgeon General* (<http://www.cdc.gov/nccdphp/sgr/sgr.htm>) provides a comprehensive overview and a call to action (US Department of Health and Human Services, 1996). Results from laboratory studies, clinical trials and epidemiological investigations provide convincing evidence that increasing one's level of physical activity—especially for those who are sedentary—has multiple beneficial health effects. These include reducing the risk of prematurely dying from coronary heart disease (CHD), type 2 diabetes and colon cancer. Endurance-type exercise can improve mental health, and reduce the risk of developing obesity and osteoporosis. Regular physical activity also preserves functional independence in older adults.

When all research is considered collectively, a dose–response relationship between activity levels and disease prevention is clearly evident (US Department of Health and Human Services, 1996). As illustrated in Figure 1, investigators from numerous recent epidemiological studies have reported this relationship in men and in women, and in many countries. These data are for all-cause mortality. Much of the inverse relation between activity amount and all-cause mortality is due to the inverse relationship between activity amount and cardiovascular diseases (CVD). However, some studies have demonstrated a significant inverse relationship between activity level and cancer mortality and non-CVD mortality. The particular studies included in Figure 1 were selected based on being representative of those with the

strongest research design, methodology and analysis.

How much exercise is enough? What is an appropriate dose of physical activity (type, duration, intensity, frequency) to reduce disease risk and enhance well-being? Although specific recommendations may vary with age and health status, a consensus guideline is that every adult should accumulate 30 min or more of moderate-intensity endurance-type physical activity over the course of most days of the week (Pate *et al.*, 1995; NIH, 1996; American College of Sports Medicine, 1998). For example, a sedentary office worker could meet this standard by briskly walking 2 miles at lunchtime every day of the workweek. Using population attributable risk, a 5–6% reduction in mortality from CHD, diabetes and colon cancer (30 000–35 000 deaths per year in the US) could be realized if 50% of the population made increases in physical activity practices consistent with the consensus guideline (Powell and Blair, 1994).

Additional health and functional benefits can be achieved by more time in moderate-intensity activity or by substituting more vigorous aerobic activity such as jogging. Additionally, it is recommended that strength-developing activities for the major muscle groups (such as resistance training or calisthenics) and flexibility training be performed at least twice a week (Pate *et al.*, 1995; NIH, 1996; American College of Sports Medicine, 1998).

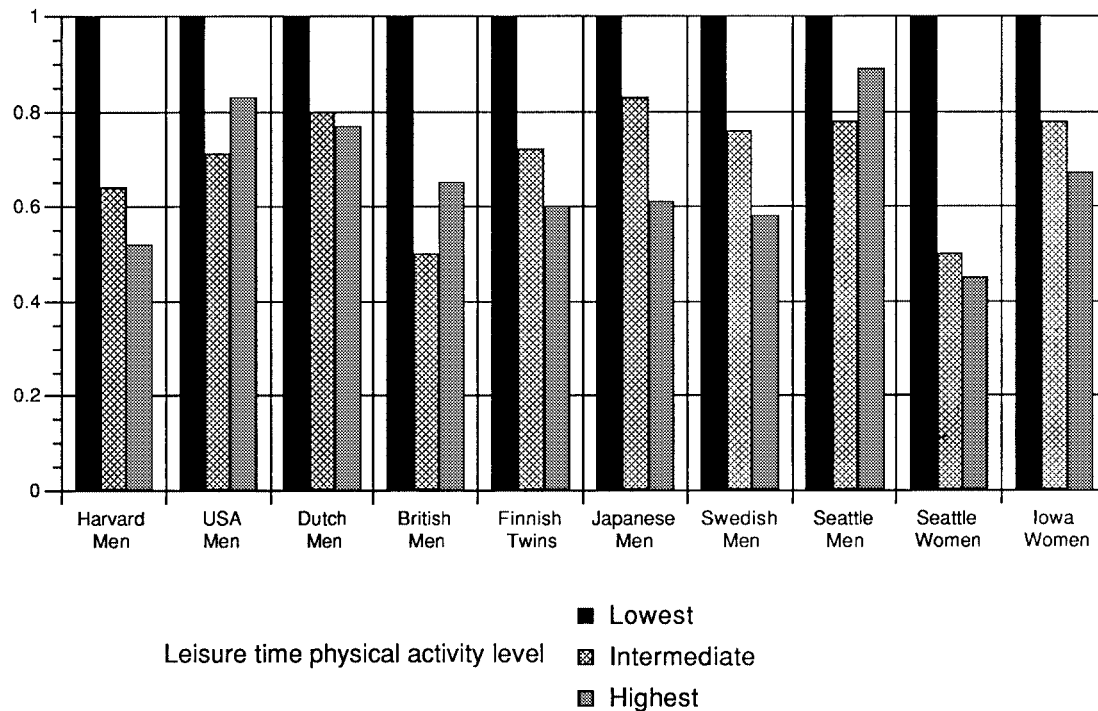
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### **The need to understand physical activity as a health behavior**

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Like most human behaviors, physical activity is a complex behavior. Physical activity in our daily lives is determined by a web of factors that has become more intricate over the past century as advances in science and technology continually change our world. In attempting to understand physical activity as a health-enhancing behavior, it is useful to adopt an ecological perspective (Sallis and Owen, 1997). In this framework, behaviors are viewed as an outcome of the interactions among personal attributes (biological and psychological)

## Mortality Risk Ratio



**Fig. 1.** All-cause mortality rates for least active persons are expressed as 1.00 for each study. Rates for persons classified as performing intermediate or highest amounts of activity are expressed as a risk ratio in relation to the rate for the least active. For example, a value of 0.80 for the intermediate group means that the mortality rate for this group was calculated to be 20% less than that of the least active group. References from left to right: (Paffenbarger *et al.*, 1993; Leon *et al.*, 1987; Bijnen *et al.*, 1998; Wannamethee *et al.*, 1998; Kujal *et al.*, 1998; Hakim *et al.*, 1998; Rosengren *et al.*, 1997; LaCroix *et al.*, 1996; Kushi *et al.*, 1997).

and environmental factors (social influences and physical facilities/surroundings). This holistic approach attempts to encompass all possible determinants of physical activity behavior for free-living individuals. It provides the larger context within which different models and theories can be developed and tested.

In recent years there has been an increased awareness of the need for theory-driven research on the process of health behavior change. A number of behavior change theories have been applied to the promotion of physical activity with promising results. To illustrate the different types of theories, four examples, i.e. Social Cognitive Theory, Behavior Modification, the Transtheoretical Model and Social Marketing Theory, are briefly described.

Social Cognitive Theory (Bandura, 1977), one

of the most widely adopted theories applied to health promotion, is based on the principle of *reciprocal determinism* which refers to the way behavior and environment continuously interact and influence each other. Social Cognitive Theory holds that two basic cognitions are vital for the prediction of a behavior change. The first cognition, *outcome expectancy*, is defined as a person's estimate that a given behavior will lead to certain outcomes (e.g. 'If I will exercise, I shall lose weight'). The second basic cognition is *self-efficacy*, the conviction that one can successfully execute the behavior required to produce an outcome (e.g. 'I am capable of exercising to the extent that I will lose weight').

Behavior Modification (Skinner, 1953) is similar in many respects to approaches applied from Social

Cognitive Theory. A central tenet of Behavior Modification is that altering consequences is the most powerful method for changing behavior. *Reinforcers* (rewards such as money, certificates, socializing) increase behavior, whereas *punishers* (such as discomfort during exercise, embarrassment due to poor performance, fear of injury) reduce the probability of repeating the behavior. Interventions to increase physical activity should be designed with multiple reinforcers that are strong and temporally close to the physical activity behavior, whereas punishers should be minimized or eliminated.

The Transtheoretical Model (Prochaska and Marcus, 1994), popularly referred to as the Stages of Change Model, describes five different stages of motivational readiness which appear to be common to most behavior change processes (i.e. *precontemplation, contemplation, preparation, action* and *maintenance*). A major contribution of this model is that people in different stages are shown to use different processes to move to the next stage. Thus, to move people forward toward the desired behavior, it becomes important to identify their current stage and then use strategies known to be effective for that specific stage.

Social Marketing Theory (Kotler and Zaltman, 1971) involves the application of commercial marketing techniques to the analysis, planning, implementation and assessment of programs designed to improve voluntary health behaviors among target audiences. Social marketing has supported creative experimentation with different intervention methods such as mass communication, sponsorship of events and competitions. It is less a theory in the formal sense than a planning model for health promotion. Social marketing offers a sophisticated, research-based process for achieving defined behavioral objectives in identified priority populations, with benefits to both individuals and society.

Depending on multiple factors such as the level of intervention (i.e. individual, community, organizational settings, public policy and practice), a single theory or a combination of different models and theories may be appropriate to achieve specific physical activity goals. Selection should be based

on which has the better fit with the problem under study. Comprehensive reviews and critiques on the application of these and other behavior change theories to increase physical activity levels in sedentary persons have been recently published in a theme issue of the *American Journal of Preventive Medicine* (Blair and Morrow, 1998).

In the following sections, recent campaigns in three countries, i.e. South Africa, Australia and the US, are briefly highlighted to share the variety of initiatives being used to promote physical activity to targeted populations. Many countries in Europe, South America and elsewhere are pursuing related projects. The examples that follow reflect the transition toward theory-based research. Over the next decade, experimental trials and systematic evaluations of these and similar projects will provide a much needed body of evidence. Findings from such investigations will allow us to determine the degree to which theory-driven interventions can effect long-term change in individual behavior or communities beyond, or perhaps despite, the prevailing trend of increasing sedentariness.

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### **South Africa: communities in transition**

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South Africa, with a population of 41 million and 11 official languages, is a culturally diverse country undergoing enormous transition. Seventy-five percent of South Africans are literate. This is juxtaposed with a 40% rate of unemployment. Children under the age of 15 make up one-third of the population, while adults over 65 constitute less than 5%. It is estimated that by the year 2010, 70–80% of the population will be urbanized.

While infectious diseases remain endemic in South Africa, morbidity from chronic diseases is increasing along with the prevalence of contributing risk factors such as smoking, sedentary living and a change from a more traditional to a Westernized diet. For example, in 1990, 7.6% of deaths in adult South Africans were attributed to tuberculosis and the prevalence of HIV infection was estimated to be 7.5%. At the same time, chronic diseases of lifestyle accounted for nearly 30% of deaths

between the ages of 35 and 64 years. The majority of South Africans have at least one modifiable risk factor for chronic disease (Steyn *et al.*, 1992). Moreover, in cross-sectional studies, over 40% of historically, socio-politically, disadvantaged persons living in urban communities reportedly do not participate in any leisure or occupational physical activity (Levitt *et al.*, 1993).

Physical activity and health promotion initiatives in South Africa have been fragmented, with little central government coordination. This may be attributed in part to: (1) emphasis within the formal health sector on primary healthcare delivery, (2) the collapse of physical education within public schools and historical absence of such programs in disadvantaged communities, (3) a lack of basic infrastructure in many peri-urban and urban communities, and (4) a high prevalence of urban violence and risk to personal safety.

The South African government has recently begun initiatives promoting physical activity in certain target populations. In April 1999, the first set of national guidelines incorporating physical activity was released by the Department of Health, targeting older adults, and there are several national campaigns aimed at increasing awareness regarding physical activity and health, such as National Wellness Day. However, these initiatives lack a broad-based infrastructure for implementation, as well as financial support and community awareness for sustainability. Furthermore, the effectiveness of these social marketing campaigns for increasing awareness regarding physical activity on a community level or for increasing the adoption of physical activity on an individual level has not been measured.

The impetus for increasing recognition and adoption of physical activity for health promotion has occurred largely through non-governmental groups—private, academic and sports organizations. In 1997, a regional initiative for health promotion was created, the Community Health Intervention Programs, as a joint venture between a privately funded, non-profit organization (the Sports Science Institute of South Africa) and a national insurance company (The Old Mutual).

This initiative involves a range of community bodies from civic associations, church groups, seniors clubs and children's homes to universities and teaching colleges. The aim is to enable previously disadvantaged communities to begin health promotion projects using physical activity intervention as the vehicle. Separate programs target children, adults and older adults. Community consultation precedes implementation and community leaders are trained by sport scientists, allied health professionals and physical education specialists. Co-implementation takes place for 3 months, after which time the program staff withdraw, and ownership of programs is transferred to the community and monitored on an ongoing basis.

The ultimate goal of this regional initiative is to implement a working model of broader participation in physical activity and sport, nationwide. The success of this model is dependent on a sustainable community infrastructure. Moreover, this program is only implemented in communities that have specifically requested to be considered. As a result, on a community level, there are already resources or 'experts' and a core group of individuals who are beyond the pre-contemplative stage of change. The face-to-face intervention and the training of community leaders may improve the adoption of physical activity by improving self-efficacy of participants. Early results in older adults have demonstrated a significant increase in exercise-related physical activity, improved functional capacity and lowered systolic blood pressure.

One of the few national initiatives linking physical activity and health promotion is the WHO Health-Promoting Schools Network which falls under the Health Promotion Directorate of the South African Department of Health. Aimed at developing infrastructure on which to build sustainable projects, the program has the potential to promote healthy living at the 'grass roots' level. A health-promoting school is one in which all members work with available resources to promote the well-being of the entire school community. The health-promoting school model is one of the few models that demonstrates inter-sectoral

collaboration and the integration of environmental policy, e.g. with health policy. The promotion of physical activity is to be one of the primary interventions through which health promotion takes place.

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### **Australia: collaborative strategies and leveraging the Sydney 2000 Olympics**

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Australians have an image as an active outdoor, sporting people. Despite this attractive mythology, the 'bronzed Aussie' is as likely as any North American to be overweight and unfit. The CPI ('couch potato index') for Australia is much like that of other urbanized nations—some 30% of adults are almost totally sedentary in their leisure time (Owen and Bauman, 1992). Australian Aboriginal people, while only a small percentage of the total population, have disproportionately high rates of diabetes and increasingly suffer from 'Westernized' disease patterns. There have been concerted efforts in Australia to activate the whole population. In the early 1990s, the National Heart Foundation conducted large-scale campaigns based on the Social Marketing Theory. Campaigns included mass media, community events and focused training of health professionals. A systematic evaluation demonstrated significant increases in campaign message awareness and walking for exercise in older and less educated subgroups (Owen *et al.*, 1995).

A new national strategy—'Active Australia'—was launched in 1997 as a joint initiative of the national government's health and sport and recreation sectors. 'Active Australia' promotes collaboration between the many sectors of government and industry with an aim to increase people's choices and opportunities to be more physically active. Education, transportation, urban planning and local government have important roles in the Australian national strategy. Much of the energy and leadership behind the Australian initiatives is being stimulated by the Sydney 2000 Olympics. The public interest and massive media exposure associated with Sydney 2000 will provide a unique

opportunity to promote the health benefits of physical activity to the entire population.

Recent campaigns in Australia have included a focus on activating the 'sedentary but motivated'—those in the contemplation stage of the Transtheoretical Model as it is applied to physical activity (Donovan and Owen, 1994; Prochaska and Marcus, 1994). This campaign target group has a high proportion of older and less well-educated Australians (Booth *et al.*, 1993), and in previous campaigns was the population segment most-responsive to initiatives promoting regular exercise through moderate-intensity activity and walking (Booth *et al.*, 1992; Owen *et al.*, 1995).

Specific components of the new 'Active Australia' programs that target increased physical activity include: (1) paid mass-media advertising to inform those in the target group about the importance of regular, moderate-intensity physical activity, (2) specific community physical activity events in partnership with the National Heart Foundation, sport and recreation bodies, and local governments, and (3) a major focus on providing physical activity advice through primary care providers (Commonwealth Department of Health and Family Services, 1998). The leadership in these initiatives has involved experts from several disciplines and professions including health and physical education, epidemiology, behavioral science, and members of several medical specialties.

The overall portfolio of 'Active Australia' programs aims also to develop effective environmental approaches to increasing physical activity in the whole Australian population (Sallis *et al.*, 1998). This cross-cutting objective is being achieved through formal inter-sectoral partnerships with agencies involved in the transportation, urban planning, local government, environment and private sectors (Commonwealth Department of Health and Family Services, 1998).

Australia's efforts are driven by a strong national commitment to prevent the many diseases associated with inactivity and obesity. The central challenge is to take those efforts beyond personal health and to link them to the values and goals of schools, communities, government and industry. A

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practical manifestation is, for example, promoting walking and cycling, which, in turn, is synergistic with the goals of improving urban environments and reducing automobile emission levels. One of the major lessons learned from the recent Australian programs and current initiatives is the importance of a multidisciplinary evidence-based approach. Promising interventions and strategies must be based on expert input from the epidemiologists integrated with that of the behavioral scientists (Booth *et al.*, 1992; Owen *et al.*, 1995; Sallis and Owen, 1999).

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### **The US: initiatives in schools, healthcare settings and worksites**

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In March 1997, the Centers for Disease Control and Prevention published 'Guidelines for school and community programs to promote lifelong physical activity among young people' (Centers for Disease Control and Prevention, 1997). Schools and communities have the potential to improve the health of young people by providing instruction, programs and services that promote enjoyable, lifelong physical activity. Ten broad recommendations were developed focusing on topics such as physical education, health education, facilities/environment, extracurricular activities, health services and parental involvement. Key recommendations include: (1) develop students' mastery of and confidence in behavioral skills needed (e.g. self-monitoring, goal setting, managing barriers) to adopt and maintain a healthy lifestyle that includes regular physical activity, (2) provide access to safe spaces and facilities for physical activity in the school and community, (3) discourage the use of or withholding of physical activity as punishment, and (4) encourage parents to be physically active role models, and to plan and participate in family activities that include physical activity. This report reflects the importance of social support and environmental considerations in increasing physical activity in children and youth. These guidelines have been widely disseminated across the US, to school districts, communities, local and state governments, and associated professionals.

Healthcare settings in the US offer a unique opportunity to counsel adults and young people about physical activity. Eighty percent of the population has at least one visit to a primary care physician every year. As esteemed professionals, physicians can significantly influence their patients regarding healthy lifestyles. An example of such an initiative is Project PACE (Physician-based Assessment and Counseling for Exercise), the aim of which is to provide primary care physicians the tools to counsel patients on strategies for incorporating exercise into their daily routine (Calfas *et al.*, 1996). Developed by behavioral and social scientists using Social Cognitive Theory and the Transtheoretical Model, Project PACE materials are used by designated members of the healthcare team to individualize brief counseling messages for patients. Initial findings indicate that this intervention is efficacious in producing short-term increases in physical activity among previously sedentary patients.

As a follow-up to the Project PACE findings, a larger, randomized physical activity intervention study known as the Activity Counseling Trial (ACT) is currently underway (Blair *et al.*, 1998; King *et al.*, 1998). ACT is a NIH-funded, multi-center study designed to evaluate three behavior-change interventions to promote physical activity in the primary care setting among sedentary adults, 35–75 years of age. The goal is to increase physical activity by 2 kcal/kg body weight per day (i.e. around 800–1000 kcal/week). The three interventions—standard care control, staff-assisted intervention or staff-counseling intervention—differ in the amount of interpersonal contact and resources required. The research teams are comprised of both biomedical and behavioral specialists, including physicians, nurses, exercise physiologists, biostatisticians, health educators and psychologists.

Intervention strategies are based on altering key mediators of physical activity. For example, based on Social Cognitive Theory, strategies to enhance self-efficacy (one's confidence to be physically active in variable settings), an intra-personal mediator, are expected to produce increases in physical activity. Similarly, targeted inter-personal medi-

ators include modeling of physical activity by others and social support directly related to physical activity participation. The Transtheoretical Model (stages of change concept) is also used to select appropriate intervention techniques dependent on the participant's stage of motivational readiness.

The ACT timeline is a 6-month intervention and an 18-month follow-up. The primary outcomes are physical activity (estimated energy expenditure per week) and cardiorespiratory fitness (maximal oxygen uptake). Secondary outcomes include changes in CHD risk factors and selected psychosocial variables (e.g. self-efficacy, stages of change, social support, quality of life). This study will assess the utility of theory-based interventions in increasing physical activity during the treatment period *and* their efficacy in maintaining a higher level of physical activity in the longer term.

To unite the strengths of public, private and industry efforts into a collaborative partnership to inspire Americans to lead physically active lifestyles, the National Coalition for Promoting Physical Activity (NCPA) was created in 1995. The NCPA (<http://www.ncppa.org/>) comprises over 100 member organizations with executive leadership coming from the American College of Sports Medicine, the American Heart Association, the Association for Worksite Health Promotion, and the American Alliance for Health, Physical Education, Recreation and Dance.

A major initiative of the NCPA is the National Behavior Change Campaign, known as AIM 2010. AIM 2010 is a 15-year institutional and community capacity-building strategy that diffuses behavior change intervention in phases that will culminate in a national campaign that addresses both individual behavior change and environmental and policy initiatives to promote physical activity. AIM 2010 emanated from a 50-day worksite intervention at a federal agency using the Stages of Change Model to promote regular, moderate physical activity (Cole *et al.*, 1998). More than one-third (35%) of 1192 participants progressed one or more stages during the intervention. Multiple pilot sites are now active in state health departments, public school systems and major corporations.

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## Conclusions

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Public health experts now recognize the health-damaging mismatch between a human phenotype designed for regular physical activity and an environment that increasingly acts to minimize activity (US Department of Health and Human Services, 1996). Concurrent with public health initiatives, our knowledge base continues to expand rapidly across a spectrum of disciplines ranging in focus from the cell to the population: genetics and molecular biology, basic and applied physiology, the behavioral and social sciences, and epidemiology and other public health disciplines.

Where might we find the most effective solutions to preventing the highly prevalent and deleterious health consequences of the evolutionary mismatch? Will we continue the trend of increasing dependence on pharmacological interventions to control chronic diseases associated with lifestyle when non-pharmacological, behavioral interventions are viable options and may be more cost-effective and safer? Or, is it possible to have a fundamental re-examination and re-working of public policies that address the consequences of rapid technological change and expanding Westernization?

Some first steps have been taken in that direction. In capsule views, we have described initiatives in Australia, South Africa and the US. Can our observations on cooperative ventures among health, education, industry and government sectors in Australia and the US be beneficial in preventing the decline in physical activity associated with urbanization in developing countries such as South Africa? One lesson is the need for healthcare clinicians and behavioral scientists to be proactive, persuasive and collaborative with business leaders and policy makers to incorporate environmental features that foster physical activity (e.g. green spaces/parks, walkways, bicycle commuter trails) in all aspects of development.

An interesting comparison can be made between current initiatives to increase physical activity and ongoing initiatives to decrease the use of tobacco. The first US Surgeon General's Report on Smoking and Health was published in 1964. Since then, we



have seen impressive progress in research and public-health action—smokers now form less than one-quarter of the adult population in the US, Australia and other industrialized countries. Much of what we have learned from these experiences will apply to the public health imperative to reduce sedentary behaviors.

The 1996 US Surgeon General's Report on Physical Activity and Health has set a challenging new agenda for research and public health advocacy. Will enforced sedentary behavior in schools and workplaces eventually have to be designated as a health risk similar to passive smoking? Will environmental and social-change solutions, which go against prevailing economic and technological trends, be achievable? Solutions to combating pervasive sedentariness are also related to broader questions about the quality, safety and sustainability of human environments, and ultimately to the longer-term survival of the planetary biosphere (McMichael, 1993). Re-incorporating a modicum of physical activity into our daily life is a key health initiative on which we—as individuals, communities, nations and as a species—need to act.

In summary, the aim of this essay has been to set the backdrop, the larger context, for the challenges that lie ahead in promoting physical activity population-wide. A brief journey highlighting the decline in habitual physical activity with modernization, the casual link between physical activity and health, and the need for theory-based research to better understand physical activity as a health behavior has been made. Examples of ongoing physical activity promotion projects in South Africa, Australia and the US have been shared. It is evident that if physical activity promotion is to succeed as a public health initiative, a multidisciplinary team approach is required. Professionals in health behavior will play an increasingly important role in the future research agenda.

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