

Physical activity guidelines and guides for Canadians: facts and future¹

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Abstract: This article summarizes the main findings from the papers included in this journal supplement. It consolidates the evidence currently available to inform and advance the development of physical activity guidelines for Canadians, and it highlights the specific needs of various population subgroups. The challenges of translating guideline information into effective and persuasive physical activity messages, of campaigns to disseminate messages, and of related evaluations are underlined. Recommendations on how to proceed are based on the evidence base provided by this series of papers; the immediate next steps mandated by this initiative are outlined and priorities for future research are indicated.

Key words: active living, exercise prescription, health messaging, health recommendations, epidemiological research, physical inactivity, quality-adjusted life expectancy.

Résumé : Cet article résume les principales observations rapportées dans les articles de ce numéro spécial de la revue. Il confirme les résultats des études répertoriées sur la communication et l'amélioration des directives concernant la pratique de l'activité physique à l'intention des Canadiennes et des Canadiens; il souligne également le besoin de procurer des directives spécifiques à des sous-groupes de la population. Cet article insiste aussi sur la nécessité de transformer les directives en messages efficaces et convaincants, de mener des campagnes de promotion et de faire l'évaluation de ces dernières. Les recommandations sur la façon de procéder s'appuient sur les données présentées dans ces diverses études. On y présente aussi les prochaines étapes à réaliser et les besoins en termes de recherche à effectuer.

Received 30 July 2007. Accepted 1 August 2007. Published on the NRC Research Press Web site at apnm.nrc.ca on 14 November 2007.

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¹This article is part of a supplement entitled *Advancing physical activity measurement and guidelines in Canada: a scientific review and evidence-based foundation for the future of Canadian physical activity guidelines* co-published by *Applied Physiology, Nutrition, and Metabolism* and the *Canadian Journal of Public Health*. It may be cited as *Appl. Physiol. Nutr. Metab.* 32(Suppl. 2E) or as *Can. J. Public Health* 98(Suppl. 2).

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Mots-clés : vie active, prescription d'activité physique, message de santé, recommandations relatives à la santé, recherche épidémiologique, inactivité physique, espérance de vie de qualité.

[Traduit par la Rédaction]

Introduction

Canada's physical activity guide to healthy active living was released in 1998 (Health Canada and the Canadian Society for Exercise Physiology 1998). Additional guides and supplements appeared in 1999 and 2002 (Health Canada and the Canadian Society for Exercise Physiology 1999, 2002a, 2002b, 2002c, 2002d, 2002e, 2002f, 2002g, 2002h; Sharratt and Hearst 2007) and addressed the specific needs of older adults and children and youth, respectively. The papers included in this journal supplement summarize the processes involved in the development of Canada's current physical activity guides; they also provide an assessment of their impact to date, review available evidence informing physical activity guidelines, offer insights about messaging for future guidelines and guides, and make recommendations for future research and development in this important area of public health. Parallel initiatives are presently being conducted by the Department of Health and Human Services in the United States (<http://www.health.gov/PAGuidelines>) and by the British Association for Sport and Exercise Sciences (<http://www.brunel.ac.uk/bases>).

Physical activity guidelines, though based on the information available at any given time, follow a physical activity trajectory that has both a direction and velocity (Fig. 1). In addition to any potential effect that physical activity guides and their messages may have, the physical activity trajectory of the population is influenced by a host of other factors, including progressive changes in social norms, perceptions of the desirability of physical activity, and changes in the physical and social environments. Thus, for maximal effectiveness, guidelines, messages, and interventions need to be forward thinking. Either the guidelines should be designed to intercept the population trajectory at a specific point in the future, or a mechanism should be incorporated that allows adjustments in the guideline and (or) the message to follow the likely population trajectory. For example, the 1996 US Surgeon General's Report (US Department of Health and Human Services 1996) called for "30 minutes of physical activity of moderate intensity on most, if not all, days of the week" at a time when the prevalence of overweight individuals was increasing at a substantial rate (Flegal et al. 2002; National Center for Health Statistics 2006). The 1996 US guideline, however, addressed a variety of health conditions, and likely under-prescribed the volume of physical activity needed to address the rising prevalence of overweight and obesity. Since 1996, the age-adjusted prevalence of overweight plus obesity in the United States has increased by 10% (Flegal et al. 2002; Ogden et al. 2006). Nevertheless, the average per capita energy intake has shown no clear increase during this period (Wright et al. 2004), and a steady or even a growing proportion of Americans apparently meet the Surgeon General's physical activity guidelines (National Center for Health Statistics 2006). Such data suggest that the US physical activity rec-

ommendations of 1996 are insufficient either to promote or to maintain a healthy body mass. Thus, in 2005, the US Department of Health and Human Services, in partnership with the US Department of Agriculture, modified their guideline, incidentally moving it closer to current Canadian recommendations; the new guideline suggested that 60 min of moderate-to-vigorous physical activity on most days of the week was required to maintain body mass and that 60–90 min of daily moderate-intensity physical activity plus control of energy intake was necessary to achieve weight loss (US Department of Health and Human Services and US Department of Agriculture 2005). Any future planning of Canada's physical activity guidelines needs to keep this concept of a moving target in mind.

The papers in this supplement provide comprehensive reviews that can be used to support existing guides, inform modifications to existing physical activity guidelines and guides, assist in the creation of new guides, support the development of clinical practice guidelines for physical activity, direct future research endeavours, and serve as background documents for training future physical activity practitioners and scholars. The main findings from individual contributions to this supplement are presented below.

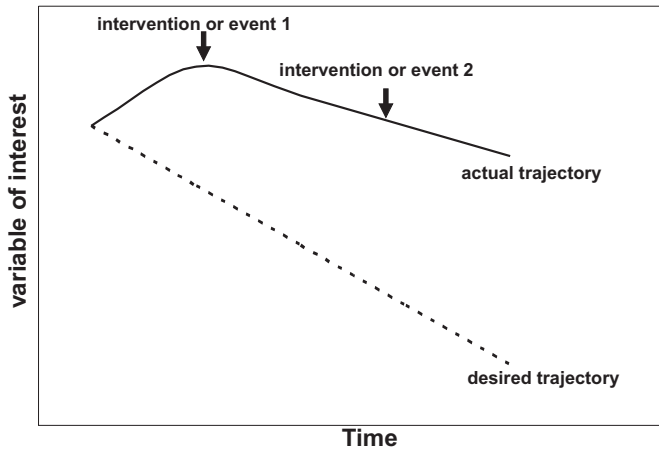
Guides: background and development (Sharratt and Hearst 2007)

This paper provides a historical chronicle of the major events leading to development of the current guides (for adults, older adults, children, and youth). The process and the steps used to create the guides are outlined, including relevant information on national partners, project administration, internal Health Canada communications, product development, endorsement activities, distribution and implementation of the guidelines, collateral activities, media relations, and development of an evaluation framework. Brief summaries of the evidence base that led to the currently recommended physical activity guidelines are included. This contribution also summarizes the various physical activity guide assessment and evaluation projects and their main findings, particularly in relation to research conducted when developing the guides and support resources for children and youth.

Guidelines for adults (Warburton et al. 2007)

This review provides a systematic update on the scientific, biological, and psychosocial evidence relevant to Canada's physical activity guide to healthy active living, with particular reference to current knowledge of the effects of physical activity on the health of adults aged 20–55 years. Most international physical activity guidelines support the recommendation of moderate-intensity physical activity on most (preferably all) days of the week. The current Canadian physical activity guidelines for adults are consistent

Fig. 1. Illustration of the hypothetical time trajectory of a given variable (e.g., physical inactivity). The difference between the actual and the desired trajectory, and the impact of the first and second interventions, are influenced by social trends, which distort the anticipated effects of the two interventions. In this figure, hypothetical event 1 (e.g., a new ParticipACTION campaign) reversed the divergence between the desired and the actual trajectory of physical inactivity, whereas hypothetical event 2 (e.g., implementation of a child fitness tax credit) seems to have had no additional impact.



with international guidelines and expert opinion. Moreover, the available literature supports the view that regular, moderate, physical activity markedly reduces the risk of premature mortality. There is overwhelming evidence that it is also an effective strategy reducing the prevalence of many chronic conditions, including coronary heart disease, stroke, hypertension, obesity, type 2 diabetes mellitus, depression, breast cancer, colon cancer, and osteoporosis. In many instances the dose–response relationship appears to be linear, with further health benefits accruing from increasing levels of physical activity. Although the current Canadian guidelines for adults seem sufficient to reduce the risk of many chronic diseases, further refinement is likely required to tackle the current epidemic of obesity.

Further investigation is required to establish whether a weekly volume of physical activity lower than that currently recommended by most health and fitness agencies is still associated with some reduction in the risk of various chronic conditions. There is also a need to determine the minimal and optimal levels of physical activity required to address the current epidemic of obesity and to examine any differences in the relationship between physical activity and health in specific sub-groups of the population (including females, various ethnic and racial groups, and those of low socioeconomic status).

Guidelines for older adults (Paterson et al. 2007)

An abundance of epidemiological research confirms the benefits of physical activity in reducing the risk of various age-related morbidities and all-cause mortality in older adults. Literature that focuses on key physical activity variables (e.g., intensity, type, and volume) suggests that the amount of activity required for benefit in this age group is that which engenders improved cardiorespiratory fitness,

strength, and power, and, indirectly, improved balance (Paterson et al. 2007). Age-related declines in each of these factors are sufficiently large as to impinge on the activities of daily living during old age. However, appropriate physical activity can minimize such declines in function, thus preventing older adults from crossing thresholds that lead to physical disablement (Verbrugge and Jette 1994). Both cross-sectional and longitudinal data demonstrate that cardio-respiratory fitness is associated with functional capacity and independence; strength and, importantly, power are related to performance and activities of daily living, whereas balance–mobility in combination with power is important in reducing morbidity from falls. Exercise interventions have documented that older adults retain the ability to adapt physiologically, with resulting gains in functional capacities. From the few studies that have explored minimal and optimal requirements, it appears that a minimum of moderately vigorous activity may be needed to achieve and to conserve related health benefits. Thus, physical activity recommendations for the older adult should emphasize activities that maintain functional capacity and independence; such activities will also delay morbidity and mortality. At the relative fitness level of most older adults, moderately vigorous walking offers a cardio-respiratory activity of appropriate intensity, but it should be supplemented with strength and power training to maintain muscle mass and “balance–mobility practice.”

Guidelines for children and youth (Janssen 2007)

Strong evidence suggests that 60 min/d of physical activity brings meaningful health benefits to most children and youth. Indeed, with the exception of the Canadian recommendations, physical activity guidelines for children and youth developed since 1998 have specified 60 min on all or most days as a minimal physical activity target. Canada’s physical activity guides for children and youth (Health Canada and the Canadian Society for Exercise Physiology 2002a, 2002b) recommend an increase of 30 min/d of physical activity as a minimum, with a gradual progression until 90 more min/d of physical activity has been achieved. The Canadian guide is also unique in recommending a similar progressive decrease in non-active time. The limited amount of dose–response evidence currently available for this age group suggests that more physical activity is better, and that health benefits may be further increased by undertaking more than 90 min/d of physical activity. The US National Association for Sports and Physical Education and the Australia Department of Health and Ageing have each set both minimal and optimal targets, recommending at least 60 min, and up to several hours, of moderate to vigorous intensity physical activity every day. This is consistent with current Canadian guidelines that recommend doing greater amounts and more intense activity than currently practiced. Persuasive messages need to be developed that encourage those who are very inactive to engage in at least a modest amount of physical activity. Different and specific persuasive messages are needed to encourage children and youth who are already moderately active to achieve even greater benefits (Brawley and Latimer 2007). Although high levels of physi-

cal activity are desirable from both a biological and health perspective, from a behavioural perspective considerable efforts are required to bring most children and youth to such levels; in many communities, the current physical and social environments militate against achievement of these targets.

Canadian physical activity guidelines are currently lacking for both preschool children (addressed by Timmons et al. 2007) and for 15–19-year-olds. Current evidence suggests that the amount of physical activity appropriate for health and well-being in younger adolescents is also appropriate for older adolescents (Strong et al. 2005). The 15–19-year age range is an important period; such youth are becoming independent, less frequently elect to take physical education at school, and are less reliant on active transportation. Not surprisingly, physical activity declines sharply during adolescence.

Guidelines for preschool children (Timmons et al. 2007)

Alarming trends in obesity among preschool children have re-focused attention on the importance of physical activity in this age group. With this increased attention comes the need to identify the type and amount of physical activity appropriate for healthy growth and development of preschool children. This review summarizes pertinent literature on the nature of physical activity required to promote healthy physical, cognitive, emotional, and social development during these early years. Limited scientific evidence supports a link between physical activity and biological and psychosocial development during early childhood (ages 2–5 years). As little as 60 additional minutes of physical activity per week may improve bone properties, aerobic fitness, and motor skills in some children. Surprisingly, there is little evidence that enhanced physical activity controls adiposity among preschool children. In contrast, a burgeoning body of literature describes the determinants or correlates of physical activity among preschool children; this information will be important in informing policy related to physical activity promotion for preschoolers. Recommendations for appropriate patterns of physical activity are made on the basis of the best available evidence, a balance of scientific evidence and expert opinion. Nevertheless, the type and amount of physical activity required to optimize growth and development during the preschool years is as yet unknown, and the need for further research is highlighted.

Guidelines for Canadians with a disability (Martin Ginis and Hicks 2007)

This paper addresses the issue of physical activity for the millions of Canadians who live with some type of physical disability that interferes with the performance of daily activities. The emerging research literature strongly suggests that such people have just as much (if not more) to gain from physical activity than do people without disabilities. However, there are unique challenges and insufficient resources when promoting physical activity for this segment of the Canadian population. This contribution takes four specific physical disabilities as examples (fibromyalgia, multiple sclerosis, arthritis, and spinal cord injury), outlining why we cannot simply copy existing physical activity guides and

guidelines and apply them to people with disabilities. Barriers to participation in physical activity that are particularly significant in this population include aspects of the built environment, costs of participation, lack of knowledge, and psychological deterrents.

Further research is needed to determine the optimal types, durations, and intensities of activities for people with different types of disabilities; recommendations should be applicable to a range of upper- and lower-body activities, such as swimming, arm ergometry, chair exercises, and wheeling. Providing guidelines for a wide range of activities will ensure that recommendations are relevant to people with many types of physical abilities. Recommendations should be accompanied by appropriate considerations and specific cautions for people with various types of disability. Activity guides should provide adequate resources to enable people with disabilities to overcome the many barriers to their participation in physical activity. Although such individuals face more barriers than the general population, they may also gain more than the general population from an increase in their physical activity.

Guidelines for Aboriginal peoples (Young and Katzmarzyk 2007)

Although a separate guide for Aboriginal groups may be desirable from a communications and messaging standpoint, a review of the literature shows a lack of scientific evidence to justify creating different physical activity recommendations within the various guides for aboriginal peoples. There is a lack of descriptive data that is valid, reliable, comprehensive, and representative of major regions and cultural groups across the country. More research is needed to identify determinants of and barriers to physical activity in a variety of environmental and cultural contexts. There is also a requirement for scientifically rigorous research to investigate gene-behaviour-environment interactions in the development of chronic diseases, some of which may be unique to Aboriginal people. Formal evaluations of interventions launched under the Aboriginal Diabetes Initiative are seriously lacking, making the utility of these projects sub-optimal. Such basic background research is a prerequisite to the development of evidence-based physical activity guidelines for specific populations, but such investigations have yet to be undertaken.

The process initiated by the Canadian Society for Exercise Physiology, with funding support from Health Canada and the Public Health Agency of Canada (of which this supplement is the first product) is an important step in this direction. Further, the inclusion of a section on Aboriginal people recognizes their important health needs, including tremendous ethnic and regional disparities in health status, and the urgent need for the promotion of physical activity in a broader strategy designed to abort the emerging epidemic of chronic disease faced by Aboriginal people.

Evaluation of Canada's physical activity guides (Cameron et al. 2007)

This paper examines the reach of *Canada's physical activity guide to healthy active living* for adults (Health Can-

ada and the Canadian Society for Exercise Physiology 1998) and its impacts, including immediate effects (awareness, knowledge, beliefs, future intention to be active, and first steps towards behavioural change) and population levels of physical activity. Analysis is based on data from eligible Canadian adults aged 18 years and older ($n = 8892$) included in the 2003 Physical Activity Monitor, a cross-sectional, telephone interview survey that provided a representative population sample. Secular trends among Canadians aged 12 years and older were examined relative to representative samples from the Statistics Canada National Population Health Survey and the Canadian Community Health Surveys.

Unprompted recall of any guideline for physical activity was very low (4%), but prompted recall of *Canada's physical activity guide to healthy active living* was greater (37%). Unprompted and prompted recall was higher among women and high-income earners, and increased with education. Behaviours associated with "seeking information" and "initiating action" were associated with both unprompted and prompted recall. Beliefs about the benefits of physical activity and intention to be active were also associated with prompted recall. Unprompted guideline recall, knowledge about the amount of activity required to meet the guideline as presented in *Canada's physical activity guide to healthy active living*, intention to be active, "seeking information", and "initiating action" were all associated with being "sufficiently active".

Canada's physical activity guide to healthy active living contains an appropriate set of public health guidelines or recommendations around physical activity. The low unprompted recall rate points to the pressing need for a coordinated, well-funded, national approach to communicating these guidelines, involving governmental and non-governmental partners and intermediaries in municipalities, schools, workplaces, and the recreation, public health, and health care systems.

Messaging strategies and realistic expectations (Brawley and Latimer 2007)

Physical activity guidelines offer evidence-based behavioural benchmarks that relate to reduced risks of morbidity and mortality, provided that people adhere to the recommendations. Essentially, the guidelines tell people what to do, but not why or how they should do it. Thus, to motivate adherence, messages that translate guidelines should convey not only how much physical activity is needed and why it is recommended, but also how to achieve the recommendation. Canada's physical activity guides exemplify how such guidelines can be translated. This paper provides a brief overview of the challenges encountered in creating the existing guides, highlighting important practical issues and empirical evidence that should be considered when translating guidelines into messages and disseminating these messages through messaging processes (e.g., a mass-media campaign). The successes of past efforts to translate the goals of physical activity guidelines and recent literature on messages and media campaigns each point to specific recommendations. Messages should be informative, thought provoking, and persuasive. Through a carefully planned messaging process, they should be disseminated to the pub-

lic via a multi-phase social marketing campaign; this should involve appropriate stakeholders and be thoroughly evaluated. Finally, the challenges and risks associated with a change in guidelines are noted with reference to developing messages, the messaging process, the potential for causing confusion, and the perceptions of the change by the Canadian public.

Physical Activity Monitoring data limitations (Katzmarzyk and Tremblay 2007)

Physical inactivity is a dominant public health concern in Canada. Accordingly, it is important to have a clear understanding of trends not only in physical activity but also in inactivity. Irregularities in monitoring, analysis, and reporting procedures create potential confusion among researchers, policy-makers, and the public alike. This paper consolidates reported findings, providing a critical assessment of the physical activity and inactivity surveillance procedures, analytical practices, and reporting protocols currently employed in Canada. It yields insights for the more accurate and consistent interpretation of data and offers recommendations for future surveillance efforts.

Physical activity and inactivity profiling (Esliger and Tremblay 2007)

The accurate measurement of habitual physical activity is fundamental to studying the relationship between physical activity and health. However, many physical activity measurement tools and techniques produce only summary variables such as total energy expenditure (obtained from self-report questionnaires, pedometer step counts, or minutes of moderate-to-vigorous physical activity as indicated by accelerometer). Recently developed physical activity monitoring technologies can provide more detailed information on physical activity or inactivity behaviour; this information can be used to explore more comprehensively the relationships between health and movement frequency, intensity, and duration. Previously collected objective physical activity data is used to create a detailed activity profile, demonstrating the potential of more comprehensive data utilization. The rich detail captured in this fashion creates new surveillance possibilities, and could possibly inform new physical activity guidelines. Profile data are presented in various formats, demonstrating the dangers of data misinterpretation when monitoring population adherence to Canada's physical activity guides. Recommendations for physical activity and inactivity profiling are provided and future research needs are identified.

New frontiers in physical activity assessment (Tremblay et al. 2007)

New measurement techniques allow more robust assessments of daily physical activity. Intuitive evidence supports the importance of complete-day physical activity/inactivity exposure as important to elements of fitness, health outcomes, and quality of life. To achieve satisfactory indicators of complete-day exposures, measures of non-exercise activity thermogenesis (e.g., incidental movement, lifestyle-embedded activity, posture, fidgeting) are required, in addi-

tion to measures of purposeful activity such as exercise and sport. It is also important to measure the quality and quantity of sleep, which are clearly linked with both health and physical activity while awake. Unhealthy sleep patterns may alter the expected relationships of healthy patterns of physical activity with health indicators. The complete-day physical activity and sleep exposure should be explored further to provide a better understanding of the relationship between physical activity and health, and to create better physical activity guidelines. Such exploration may lead to a modification of prescriptions for physical activity and the development of new messages that persuade people to act on these prescriptions.

Conclusions and recommendations for action

In general, the detailed information provided in this supplement supports the physical activity guidelines outlined in Canada's physical activity guides (Health Canada and the Canadian Society for Exercise Physiology 1998, 1999, 2002a, 2002b, 2002c, 2002d, 2002e, 2002f, 2002g, 2002h). Guidelines are lacking for preschool children and for youth aged 15–19 years, although there is little reason to doubt that current physical activity guidelines for youth aged 10–14 years can be applied successfully to youth aged 15–19 years. There is evidence to support the creation of specific guides for Canadians with a disability and specific guides may also be needed for Aboriginal groups. Refinement of existing guides may be required to counter trends to a growing prevalence of overweight and obesity. Physical activity guideline messaging requires crafting that avoids disenfranchising sedentary individuals, while still conveying the benefits of progressive amounts of physical activity to those who have already initiated some activity. Differentiating between minimal and optimal levels of physical activity should be explored as Canada's physical activity guides evolve. The impact of the existing guides has been modest, but would likely be enhanced through comprehensive and coordinated communication and intervention strategies involving government and non-government sectors. New, time-stamped, objective measurement techniques should be exploited to overcome previous limitations in physical activity surveillance, allowing more comprehensive assessments of physical activity, inactivity, behavioural compensation, and sleep patterns.

The papers in this supplement provide a solid foundation to inform the further development of Canada's physical activity guides, with the following recommendations:

- an expert committee be established to assess the evidence presented in this supplement, for the purpose of recommending reaffirmation, modification, revision, or additions to Canada's physical activity guides;
- consumers from the target populations provide input during the development and implementation of any new guides (e.g., for specific populations), or when making substantial changes to existing guides;
- the guidelines be appraised using the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (The AGREE Collaboration 2001);
- the evidence base presented here should be both used and expanded upon to inform the creation of Canadian clinical

practice guidelines for physical activity, thus extending the utility of the guides to clinical populations and practitioners;

- Canada should provide international leadership to reduce duplication of effort, and harmonize physical activity guidelines, message development, and messaging with the United States, the United Kingdom, and others involved in such activity;
- partnership with the newly revived ParticipACTION and other stakeholders be explored, to develop and deliver a comprehensive, nationally integrated strategy for the dissemination and promotion of Canada's physical activity guides;
- ongoing evaluations and coordinated assessments of a variety of impacts that may flow from dissemination and use of Canada's physical activity guides be planned; this will allow possible adjustments and refinements of the guides and dissemination methods, as well as an assessment of population reach, effectiveness, adoption, and nationwide implementation;
- further research be encouraged and supported to assess relationships between physical activity and health; to optimize physical activity message development and messaging; to enhance physical activity monitoring and surveillance methodologies; and to assess the extent to which such evidence varies among subgroups.

Acknowledgements

This project was supported by the Public Health Agency of Canada and the First Nations and Inuit Health Branch of Health Canada. The leadership and administrative assistance was provided by the Canadian Society for Exercise Physiology.

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