



Promoting physical activity— Ten recommendations from the Heart Foundation

A position paper for people and organisations planning to develop and promote physical activity programs. Prepared by the National Physical Activity Program Committee, National Heart Foundation of Australia, May 2001.

Chief author: Mr Trevor Shilton

Other contributors: Dr Peter Abernethy, Mr Rick Atkinson, Prof. Adrian Bauman,
Prof. Wendy Brown, Dr Geri Naughton, Prof. Brian Oldenburg,
Prof. Neville Owen, Ms Cheryl Wright.

Introduction

Physical activity – a public health priority

Lack of physical activity is a major risk factor in heart and blood vessel (cardiovascular) disease, and cardiovascular disease is Australia's leading cause of death.¹ Recent consensus from meta-analytic evidence for a cardio-protective role for physical activity is compelling.^{2,3} People who are not physically active are almost twice as likely to die from coronary heart diseases as those who are.⁴ Therefore, increasing the level of physical activity in the community is likely to have a major impact on public health.

Regular moderate physical activity throughout life (for example brisk walking) reduces the risk of all-cause mortality as well as the incidence of, and fatality rate from, cardiovascular disease, especially coronary heart disease, through a direct effect on coronary atherosclerosis.^{2,5,6} Physical activity also reduces the risk of non-insulin dependent diabetes (NIDDM) and favourably influences body weight, blood pressure and lipid profiles.²

The current low prevalence of adequate physical activity in the Australian community is of great concern. Only about 57 per cent of the adult Australian population takes sufficient physical activity for health, and the proportion of inactive Australians is increasing.¹ The rising prevalence of overweight and obesity has also given rise to greater focus on physical activity.⁷ Evidence suggests that the rising prevalence of overweight and obesity in Western societies is strongly linked to an overall decline in energy expenditure through everyday physical activity and movement.⁷

Increasing population levels of physical activity can contribute significantly to reductions in chronic disease morbidity and mortality. For the above reasons, encouraging the Australian community to become more physically active has become a public health priority.

Promoting moderate physical activity

Given the high prevalence of physical inactivity, and evidence about the benefits of moderate physical activity, policies, projects and campaigns that are likely to yield the greatest public health benefit are those that encourage regular moderate physical activity among the inadequately active.^{8,9,10} National Physical Activity Guidelines for Australians have been developed, based on the best available evidence. These encourage Australians to be active every day in as many ways as they can, and to put together 30 minutes or more of moderate-intensity physical activity on most, preferably all days.¹¹



Physical activity: a whole-of-community concern

In addition to the public health benefits that may accrue from a physically active community, physical activity has potential to deliver major social, economic, environmental and community benefits. While physical activity is an emerging priority within the health sector, it is important to acknowledge that encouraging and facilitating people to be physically active can deliver benefits that relate to the core business of transport, local government, education, planning, environment and sport and recreation.

There is growing interest in how the social and mental health benefits of physical activity contribute to the overall health benefits of being active. Individuals who are adequately active can enjoy a higher quality of life, improved physical function, reduced pain, and a higher level of social and mental health.¹²

In addition, there is growing interest in the role physical activity can play in increasing social capital. For example, participation in club, group or neighbourhood activity can increase the sense of community identity and affiliation or belonging. This may provide independent social and mental health benefits. Clubs, groups and social networks are important sources of voluntarism in the community and provide avenues for community-driven physical activity. A variety of local safe pedestrian and cyclist-friendly transport systems can provide the opportunities for people (including those who are not participants in clubs or users of sport and recreation facilities) to lead active lives.

Physical activity can make an important contribution to social capital in neighbourhoods and communities. The norms associated with social capital—reciprocity, voluntarism, altruism and trust can be built through physical activity initiatives, and physical activity participation.¹³ Physical activity can provide association, connectedness and freedom from isolation. There is growing evidence about the importance of underlying determinants of health.¹⁴ The potential positive contribution of physical activity to decreased isolation, increased civic engagement, and increased skills for participation in society can be harnessed for the benefit of the whole community.

Physical activity: a comprehensive approach

The recommendations that follow outline nine broad strategies for increasing physical activity in communities. There is growing recognition that while some strategies may prove independently effective in raising community levels of physical activity, a combination of these is optimal for increasing population levels of physical activity.¹⁵ This is consistent with a population approach to health that recognises that bringing about small changes in the whole population can deliver the most significant community benefits.¹⁶

Comprehensive, multi-strategy approaches to increasing community levels of physical activity are consistent with World Health Organisation policy,^{17,18} which places emphasis on the five main strategies of the Ottawa Charter:

- building healthy public policy
- creating supportive environments
- strengthening community action
- developing personal skills; and
- reorienting health services (WHO 1986)¹⁷

The WHO acknowledges that a comprehensive approach that uses a combination of the five strategies above is most effective in promoting health.¹⁸



Recommendations

The National Heart Foundation of Australia recommends that a comprehensive multi-strategy approach to increasing community levels of physical activity should be adopted. This should incorporate a combination of the recommendations that follow.

1. Provide a supportive physical and social environment through settings where Australians live and work.

Physical activity choices can be made convenient, easier, safer and more enjoyable through initiatives designed to create an environment supportive of participation in physical activity. Efforts should be made to ensure that environments are designed to enable people to be active as part of their everyday tasks e.g. walking to the shop to buy the newspaper.¹⁹ This will require efforts from planners and developers as well as federal, state and local government authorities.

The WHO agrees that settings such as schools, workplaces, cities and clinical settings offer practical opportunities for the implementation of comprehensive strategies.¹⁸ The neighbourhood setting also requires priority. Parks, green space, streetscapes, beaches and recreation facilities, as these are the most frequently used environments for physical activity.²⁰

It has been found that even simple environmental supports like signs or posters encouraging use of stairs instead of the lift can increase the likelihood of people choosing a physically active option.²¹ Similar cues could be designed for use in neighbourhood and community settings.

Environmental supports can increase opportunities for both structured and incidental physical activity, and may include:

Physical environment:

- safe accessible pathways and cycle-ways that make the decision to walk or cycle for transport easier;
- parks designed for intrinsic appeal, waterways, and trees for shade;
- safe environments such as parks and recreation facilities that support increasing preferences for less structured physical activity e.g. parks for skateboarding and walking as well as for structured sport and recreation;
- facilities at public transport interchanges and in workplaces such as bike racks, showers and lockers;
- play equipment, drinking fountains and shade in parks for children and space for youth;
- lighting appropriate to pedestrians and cyclists and well-connected local streets with street furniture, shade and signage.

Social environment:

- child care in recreation facilities;
- clubs and groups established to provide social support to the individual participant;
- safe, accessible and appealing public spaces.

Economic environment:

- local amenities and shops that can be easily reached on foot, by bicycle or using public transport;
- a mix of land uses and flexible use of public buildings;
- crime prevention through urban design techniques.



2. Build 'active' public policy.

Across all sectors and at all levels in the community policy decisions can impact upon the choices individuals make about physical activity. Policy can be responsible for erecting or removing barriers to physical activity participation.

A cross-community (integrated) approach to promoting physical activity would aim to put physical activity on various policy agendas, directing key decision makers to consider the physical activity impacts of policy decisions. Policy interventions can be legislative, regulatory, fiscal or organisational.¹⁷

Many of the barriers to active communities are in sectors other than health. Planning, transport, education, local government, and sport and recreation policies all may impact on physical activity. Examples include:

- guaranteeing access to physical activity programs and facilities for all by applying affordable price structures;
- regulating to ensure access for women, the aged and others with special ;
- regulating public transport fees, parking etc. to positively discriminate in favour of walking, cycling, public transport and other means of transportation that deliver health and/or environment benefits.
- ensuring safety is a consideration in planning and design, e.g. well lit and maintained footpaths;
- requiring 'Physical activity impact assessments' of new developments are conducted.

3. Provide education and publicity about the benefits of physical activity, and access to information and life skills to enable participation.

Education programs and mass media can be an effective way to raise awareness and the profile of physical inactivity as a leading risk factor for morbidity and mortality. They are insufficient of themselves to produce behaviour change. Complementary strategies such as those recommended in this paper are required to effect behaviour change.^{15,22}

Education, information and mass media campaigns are useful to promote awareness of the benefits of being active. They may also motivate people to take part, and publicise options for participation. There is some limited evidence to suggest that knowledge about physical activity is associated with participation in moderate physical activity.²³

Mass media is an effective tool for promoting health messages and campaigns.^{24,25,15} In addition, it has been demonstrated that sponsorship is effective in promoting health messages to specific groups²⁶ and in bringing about policy and structural change in sponsored agencies.²⁷ Other strategies such as use of web sites and information lines may also be effective for information transmission.

Public health professionals in Australia have a very successful track record in acquiring media coverage for health issues. The most notable success in Australia is the level of publicity and media coverage generated by the tobacco issue. Media advocacy, as part of a comprehensive approach to tobacco control, has made a significant contribution to changing social norms in relation to smoking.²⁸

Mass media campaigns are more likely to be effective if the community environment is supportive. The range and most appropriate media available for publicising programs include:

- television
- local newspapers
- community service radio announcements
- bulletin boards
- posters
- newsletters (workplace, school); and
- flyers

It is clear that mass media is more effective when it takes account of social and cultural factors as well as those relating to health. Effective community consultation frameworks are required at Local Government level. The WHO also contends that access to education and information is essential to achieving effective participation and the empowerment of people and communities.¹⁸

4. Focus on the different levels of behaviour change and tailor programs accordingly.

This paper deals primarily with population approaches to physical activity. However professionals will often work in educating or counselling individuals, where a goal of their work is to affect knowledge, attitudes and behaviours. Understanding of behaviour change processes and models can assist in providing better targeting and delivery of education, counselling, and in choosing strategies that meet an individual's needs.

One such model is the stage-of-change model. It is recognised that at any given time, some people may be ready to take action on physical activity, while others may not yet have thought about change. Education can be adapted according to individual need and readiness for change.^{29,30,31}

There are other models of human behaviour change. Specific cognitive skills have been found to motivate behaviour change and to be more prevalent among more active individuals. Some of these include:

- setting specific goals for physical activity;
- participating with a partner or group; and
- planning exercise into daily routines.

Training in these skills, may assist individuals to translate their good intentions into action.²⁰ Similarly, environmental cues may motivate physical activity behaviour. These may include proximity to a beach, river or other attractive setting.²⁰

5. Provide program options to suit varying social and cultural circumstances and motivations throughout the life cycle.

Within communities, particular groups of people have been identified as being less likely to achieve adequate levels of physical activity. For example, the inactive are more likely to be older, less well-educated and on lower incomes. Females are also less likely to be adequately active than males.³² These factors have important equity and methodological implications. In community surveys the most commonly cited reasons for not exercising include, 'no time', 'not physically able', and simply 'do not want to'.^{33,34} Other research has found that environmental challenges such as the condition of footpaths and sharing the road with motor vehicles are significant barriers to the choice to be active.^{35,36} These findings also have important implications for the choice of methodology.



Physical activity for health and well being should be a lifelong pursuit. Physical activity planners need to be aware that circumstances, interests and capacity of individuals change throughout life. Therefore, the types of options provided, need to be in tune with this different and changing need.

Activities likely to appeal to children, youth, seniors, people in the full time workforce and women with dependent children may vary considerably. Similarly, specific physical activity programs or environmental adaptations designed to meet the needs of disabled people and disadvantaged groups should be developed and supported.

When targeting parents (particularly women), who are more likely to say they do not have enough time to be physically active, consideration needs to be given to social and cultural needs. This may result in an intervention that makes physical activity more convenient through community-based and neighbourhood programs or community facilities where child-care and social support is provided. Women may also be concerned about personal security while walking or being active. Strategies such as providing lighting in public places may be pertinent.

For aboriginal people interventions may build on values such as connectedness to the land, values pertaining to the extended family and elders, or identifiable role models. An example could be to consult with aboriginal elders in community walking programs by encouraging them to tell stories about landmarks of cultural significance and publishing these on maps and in walking programs.

People are more likely to adhere to physical activity that provides a pleasant environment and opportunities for social contact. Other commonly cited motivators are 'to improve health', 'to control weight', 'because it's fun', 'to gain satisfaction or personal achievement' or intrinsic reward.³⁴

6. Provide accurate advice on physical activity to key professionals within government, non-government community and private sectors that influence physical activity participation.

The physical activity workforce is potentially very broad. Health professionals, local Government planners, sport and recreation professionals, general practitioners, allied health professionals and volunteers could all have an influence on population levels of physical activity.

Workforce development and capacity building is an important component of a comprehensive approach to raising population levels of physical activity. Strategies to ensure that professionals have access to accurate information, and are enabled to pass this information on to patients and clients include:

- Ensuring key individuals who influence physical activity policy, programs and environments are provided with the most up-to-date information on physical activity and its relationship to health, community well being and the environment. This needs to occur as part of their initial training and as part of continuing education.
- Encouraging primary health care professionals to provide advice to patients about physical activity. General practitioners see approximately eighty three per cent of the Australian adult population each year.³⁷ This, combined with public perception of the credibility and authority of medical practitioners, forms a powerful rationale for engaging them in physical activity promotion.³⁸
- Raising awareness among community groups, employers and local government authorities of their important role in providing information, implementing programs and providing supportive, safe environments for physical activity.
- Providing advice and accurate information to cardiac rehabilitation professionals and others that work with people with disease to ensure that high quality and appropriate physical activity opportunities are offered to patients.



7. Establish partnerships to pursue a cross-community and intersectoral approaches.

Partnership programs in physical activity have been recommended as the most prudent in achieving broad change in communities.^{2,18,7} Achieving sustainable increases in levels of community physical activity, and changes in the physical and social environment that will support physical activity choices, will require forging new partnerships and collaborations with sectors outside health.^{39,18}

Physical activity can be related to a range of community objectives and concerns, not simply the desire to improve health. Of particular importance are the agendas of transport planners, the environment movement, the education sector, local Government and sport and recreation.

A useful strategy to recommend for incorporating physical activity issues into planning decisions in other sectors is health impact assessment (HIA). HIA is an evidence-based method for assessing and improving the health consequences of policies and projects.⁴⁰ Health impact assessments are a structured and objective way of appraising policy and promoting inter-agency collaboration. This method can also enhance community participation in decision making.

Successful partnerships between sectors requires hard work and good will, as well as commitment to action, a considerable investment in building relationships, an agreed plan of action and planning to sustain outcomes.³⁹ In addition, partnerships need to be constructed in a way that ensures agreements are transparent and accountable and there is mutual understanding and respect among the players.¹⁸

Partnerships across sectors may be complex and constrained by factors relating to the language and culture of the sectors concerned. It is important to work towards a shared understanding of health and a clear understanding of the goals and activities of all collaborating partners. The most crucial element of any intersectoral partnership is the recognition of the interdependence between the partners to achieve a common end.⁴¹ It may be the means to an end that organisations share. For example, while health transport and the environment seek quite different ends (improved health, decongested roads, clearer air respectively), the means to these ends (walking, cycling, public transport) may be the area where common ground can be found and built upon. Partnerships that pay due attention to the above factors can result in efficiencies through combined resources and achievement of better outcomes through shared talents and skills.

A partnership between research and practice is critical. When planning, implementing and evaluating physical activity interventions major gains can be made by bringing together the complementary skills of researchers and practitioners.⁴²

8. Ensure quality physical education is provided to all children in all schools, and ensure physical activity options are available to children and youth in the broader community.

Children and youth are a special target group for physical activity programs. Several studies have reported higher levels of overweight and obesity in children since the Australian Health and Fitness Survey 1985^{43,44,45,46} conducted fitness and health measures of Australian children aged 7–15 years.

There is a strong rationale for commencing strategies for the primary prevention of cardiovascular diseases at an early age. A small but convincing number of studies suggest that cardiovascular risk factors and lifestyle behaviours track from childhood and adolescence to adulthood.^{47,48,49,50,51,52,53,54}

There is evidence from pathology studies that arterial fatty streaks can be established in children as young as 10–15 year olds.^{55,56}

Schools provide an important and convenient setting for reaching the vast majority of Australian children (aged 6–17 years). Physical activity advocates have an important role in supporting the education sector and in ensuring quality physical education is delivered to all Australian school children. Curriculum programs and policies in schools should be in keeping with the health promoting schools concept and consistent with the principles of the Active Australia Schools project and give due attention to school policies, the school environment and the school's interaction with parents and the local community. There is evidence that well conceived school-based physical activity interventions can be effective.⁵⁷



In addition it is important to ensure non-school settings such as local government and community groups give adequate priority to making provision for physical activity opportunities for children and youth. Collaboration with transport departments and local government on safe routes to school will permit increased numbers of children to walk or cycle to school safely. Special attention needs to be given to innovative out-of-school and community physical activity opportunities that can help reduce the drop-out rate of participation by adolescent girls.⁵⁸ Collaboration with local government and the private sector can result in activities that match the needs and interests of young girls. It is essential that school/community partnerships be encouraged and supported to address the issue of child and youth physical activity.

9. Advocate for due priority to be given to physical activity.

The evidence for an increased focus on physical activity is now stronger than ever. However, this is not yet reflected in commitment to comprehensive and well-funded programs. While there have been promising investments in a coordinated approach to physical activity through initiatives from the Commonwealth (Active Australia), and various initiatives such as the New South Wales Premier's Taskforce on Physical Activity, these are modest beginnings and implementation is not nationally applied or funded. Thus advocacy remains the priority strategy. Government, non-government and commercial organisations promoting physical activity have a responsibility to educate community decision-makers about the new evidence and to advocate for an increased flow of resources and greater assignment of priority to physical activity programs.

Non-government organisations such as the National Heart Foundation of Australia have an important role in leading a physical activity advocacy initiative. Academics and researchers also have important roles. Avenues for such advocacy are through the National Public Health Partnership, National Health Priority areas, the Active Australia initiative, State Departments of Health, Education, Transport, Local Government and Sport and Recreation.

10. Ensure equitable access to physical activity opportunities.

There are important and significant disparities in health status in the Australian community.² It is important that physical activity programs give due attention to equality of access, opportunity and benefit.

In keeping with this it is important to ensure that interventions target the most disadvantaged groups in the Australian community, and the most inactive. Physical activity interventions should also consider the needs of people of different cultures, ages or with disabilities. The implications of geography, climate and remoteness on physical activity participation should also be considered when designing interventions. Examples could include:

- developing programs and environmental supports to ensure physical activity opportunities are provided for Aboriginal youth in remote communities;
- providing opportunities for socially isolated elderly residents of inner cities to access health promoting activities and community facilities;
- consulting adolescent girls and constructing physical activity programs around their identified needs.



Conclusion

Each of the recommendations outlined above has independent merit. However, their greatest value is when applied in combination across the community. Such a comprehensive approach would help ensure that:

- Partnerships are established between sectors to promote physical activity;
- The physical and social environment is supportive of participation in physical activity;
- Planners, policy makers and decision-makers consider physical activity and its broader community impacts, and are actively involved in physical activity coalitions and collaborations;
- Individuals have access to information that will develop positive beliefs about the benefits of physical activity and the necessary knowledge to make informed choices;
- Individuals have enhanced skills and confidence in their ability to engage in physical activity;
- Social supports are provided in an equitable way that enables broad participation in physical activity;
- A range of convenient and enjoyable options for physical activity are provided;
- Inequalities in health status and access to physical activity opportunities are reduced;
- The above initiatives are well funded and supported.

References

- 1 Australian Institute of Health and Welfare. Australia's health 2000: the seventh biennial health report of the Australian Institute of Health and Welfare. Canberra: AIHW, 2000.
- 2 Surgeon General's Report: Physical activity and health. Atlanta, Georgia: US Department of Health and Human Services, Centers for Disease Control, 1996.
- 3 Berlin J, Colditz GA.. A meta-analysis of physical activity in the prevention of coronary heart disease. *Am J Epidemiol*, 1990;132:612-628.
- 4 Commonwealth Department of Health and Aged Care, Australian Institute of Health and Welfare. National health priority areas report. Cardiovascular health 1998. Canberra: AIHW, 1999.
- 5 Eriksson G, Liestel K, Bjornholt J, Thaulow E, Sandvik L, Erikssen J. Changes in physical fitness and changes in mortality. *Lancet*. 1998;352:759-62.
- 6 Hakim A, Petrovich H, Burchfiel C, et al. Effects of walking on mortality among non-smoking retired men. *New Eng J Med*, Jan 1998.
- 7 National Health and Medical Research Council. Acting on Australia's weight: A strategic plan for the prevention of overweight and obesity. Canberra: AGPS, 1997.
- 8 Blair SN, Kohl HW 3rd, Paffenbarger RS Jr, et al. Physical fitness and all cause mortality – a prospective study of healthy men and women. *J of the Am Med Ass* 989;262(17):2395-401.
- 9 Dunn AL, Marcus BH, Kampert JB, et al. Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: A randomised trial. *J of the Am Med Ass* 1999;281(4):327-34.
- 10 Fletcher GF, Balady G, Froelicher VF. Exercise standards: A statement for healthcare professionals from the American Heart Association writing group. Office of Scientific Affairs, American Heart Association. *Circulation*. 1995; 91(2):580-615.
- 11 Commonwealth Department of Health and Aged Care. National physical activity guidelines for Australians. Canberra: CDHAC, 1999.
- 12 Stephenson J, Bauman A, Armstrong T, Smith B, Bellew B. The costs of illness attributable to physical inactivity in Australia: A preliminary study. Commonwealth Department of Health and Aged Care and Australian Sports Commission, 2000.
- 13 Putnam RD. *Making Democracy Work*. NJ: Princeton University Press, 1993.
- 14 Marmot M. The Solid Facts: The social determinants of health. *Hlth Prom J of Aust*. 1999; 9(2):126-133.
- 15 Donovan RJ, Owen N. Social marketing and population interventions. In, *advances in exercise adherence*



- (R.K. Dishman, ed.) Human Kinetics, Champaign Illinois, 1994; pp 249-290.
- 16 King A. Community interventions for promotion of physical activity and fitness. *Exerc Sport Sci Rev* 1991;19:211-259.
 - 17 World Health Organisation. The Ottawa Charter for Health Promotion. Geneva: WHO, 1986.
 - 18 World Health Organisation. The Jakarta Declaration on leading health promotion into the 21st century. Geneva: WHO, 1997.
 - 19 Wright C, Atkinson R, Cox R, Dunn S, Ferguson K. Supportive environments for physical activity: guidelines for local government. Adelaide: National Heart Foundation of Australia, 1999.
 - 20 Corti B. The relative influence, and interaction between, environmental and individual determinants of recreational physical activity in sedentary workers and home-makers. Perth: University of Western Australia, 1998.
 - 21 Blamey A, Mutrien A, Aitchison T. Health promotion by encouraged use of stairs. *BMJ* 1995;311:289-90.
 - 22 Corti B, Bull F. Increasing participation in physical activity – A review of published interventions. Report for the Commonwealth Department of Health and Aged care. Canberra: CDHAC, 1998
 - 23 Sallis JF, Haskell WL, Fortmann FP, Vranizan KM, Taylor CB Soloman DS. Predictors of adoption and maintenance of physical activity in a community sample. *Prev Med* 1986;15:331-41.
 - 24 Booth M, Bauman A, Oldenburg B, Owen N, Magnus P. Effects of a national mass media campaign on physical activity participation. *Health Prom Int* 1992;7:241-47.
 - 25 Flay BR. Mass media and smoking cessation: A critical review. *Am J Pub Health* 1987;77(2):153-60.
 - 26 Donovan RJ, Corti B, Holman CJD, West D, Petter D. Evaluation sponsorship effectiveness. *Health Prom J Aust* 1993;3(1):63-68.
 - 27 Corti B, Holman CDJ, Donovan RJ, Frizzell S, Carroll A. Using sponsorship to create healthy environments for sport, racing and arts venues in Western Australia. *Health Prom Int* 1995;10(3):185-97.
 - 28 Puska P, Toumilehto J, Nissinen A, et al (eds.) The North Karelia Project: twenty years of results and experience. Helsinki: Helsinki University Printing House. 1995.
 - 29 Prochaska JO, Di Clemente CC. Stages and processes of self-change in smoking: Towards an integrative model of change. *J Consult Clin Psychol* 1983;51:390-395.
 - 30 Prochaska JO, Marcus BH. The transtheoretical model: Applications to exercise. In RK Dishman (Ed.), *Advances in exercise adherence* (161-180). Champaign, Illinois: Human Kinetics. 1994.
 - 31 Marcus BH, Owen N. Motivational readiness, self-efficacy and decision-making for exercise. *J Appl Psychol* 1992;22(1):3-16.
 - 32 Armstrong T, Bauman A, Davies J. Physical activity patterns of Australian adults. Results of the 1999 national physical activity survey. Canberra: Australian Institute of Health and Welfare. 2000.
 - 33 Stephens T, Jacobs DR, White CC. A descriptive epidemiology of leisure-time physical activity. *Pub Health Rep* 1985;100:147-158.
 - 34 Jones-Roberts A, Shilton TR, Motivators and barriers to exercise: A community survey. *ACHPER Nat J* 1990;130:23-26.
 - 35 Craythorn E. Inactivity and the environment report. Dubbo: Dubbo, Orana and Far West Region Health Promotion Unit, 1993.
 - 36 Wright C, Atkinson R, MacDougall C, Booth B. Exercise in daily life: supportive environments. Adelaide: National Heart Foundation of Australia, 1996.
 - 37 Bridges-Webb C, Britt H, Miles DA, Neary S, Charles J, Traynor V. Morbidity and treatment in general practice in Australia. *Aust Fam Physician* 1993;22(3):336-39.
 - 38 Department of the Arts, Sport, the Environment and Territories. Pilot survey of the fitness of Australians. Canberra: AGPS, 1992.
 - 39 Harris E, Wise M, et al. Working together: Intersectoral action for health. Canberra: AGPS, 1995.
 - 40 Lock K. Health impact assessment. *BMJ* 2000; 320:1395-1398.
 - 41 Gray B. Collaborating: Finding common ground for multi-party problems. California: Jossey Bass Inc. 1989.
 - 42 Holman CDJ. Creating partnerships, building systems: Improving interactions between research and practice. *Health Prom J Aust* 1996;6(2):21-25.
 - 43 Booth ML, Wake M, Armstrong T, Chey T, Hesketh K and Mathur S. Prevalence of overweight and obesity and physical activity among Australian young people. (Abstract) International congress on sport science and



- sport medicine and physical education, Brisbane, Australia, September, 2000.
- 44 Lazarus R, Wake M, Hesketh K, Waters E. Change in body mass index in Australian primary school children, 1985-1997. *Int J Obes* 2000; 24:679-684.
 - 45 Lynch J, Wang XL, Wilcken DEL. Body mass index in Australian children: recent changes and relevance to ethnicity. *Arch Dis Child* 2000; 82:16-20.
 - 46 Pyke JE. Australian health and fitness survey 1985: The fitness, health and physical performance of Australian school students aged 7-15 years. Adelaide: ACHPER, 1985.
 - 47 Bao W, Threefoot SA, Srinivasan SR, Berenson GS. Essential hypertension predicted by tracking of elevated blood pressure from childhood to adulthood: The Bogalusa Heart Study. *Am J Hypertens* 1995;8:657-65.
 - 48 Kelder SH, Perry CL, Klepp KI, Lytle LL. Longitudinal tracking of adolescent smoking, physical activity and food choice behaviours. *Am J Pub Health* 1994; 84:1121-6.
 - 49 Guo SS, Roche AF, Humlea WC, et al. The predictive value of childhood body mass index values for overweight at age 35 years. *Am J Clin Nutr* 1994;59:810-19.
 - 50 Webber LS, Cresanta JL, Voors AW, et al, Tracking of cardiovascular disease risk factor variables in school age children. *J Chron Dis* 1983;36:647-660.
 - 51 Berenson GS, Wattigney WA, Bao W, Srinivasan S, Radhakrishnamurthy B. Rationale to study the early natural history of heart disease: The Bogalusa heart study. *Am J Med Sci* 310 (Supp 1) 1995; S22-S28.
 - 52 Myers L, Coughlin SS, Webber LS, Srinivasan S, Berenson GS. Prediction of adult cardiovascular multifactorial risk status from childhood risk factor levels. *Am J Epidemiol* 1997; 142:918-924.
 - 53 Raitakari OT, Porrka KV, Taimela S, Rasanen L, Viikari JSA. Effects of persistent physical activity and inactivity on coronary risk factors in children and young adults> The cardiovascular risk in young Finns study. *Am J Epidemiol* 1994; 140:195-205.
 - 54 Twisk JWR, Kemper HCG, van Mechelen W, Post GB. Tracking of risk factors for coronary heart disease over a 14 year period: A comparison between lifestyle and biologic risk factors with Data from the Amsterdam Growth and Health Study. *Am J Epidemiol* 1997; 145:888-898.
 - 55 Newman WP, Freedman DS, Voors AW et al. Relation of Serum lipoprotein levels and systolic blood pressure to early atherosclerosis. The Bogalusa Heart Study. *New Eng J Med* 1986;314:138.
 - 56 Strong JP, Malcolm GT, McMahan CA, Tracy RE, Newman WP, Herderick EE, Cornhill JF. Prevalence and extent of atherosclerosis in adolescents and young adults: Implications for prevention from the Pathological Determinants of Atherosclerosis in Youth Study. *J Am Med Ass* 1999; 281(8):727-35.
 - 57 Stone EJ, Mckenzie TL, Welk GJ, Booth ML. Effects of physical activity interventions in youth: Review and synthesis. *Am J Prev Med* 1998;15(4):298-315.
 - 58 Booth M, Macaskill P, McLel L, et al. NSW schools fitness and physical activity survey, 1997. Sydney: NSW Department of School Education, 1997.

