

POTENTIAL APPROACHES FOR THE PROMOTION OF PHYSICAL ACTIVITY

A review of the literature

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EXECUTIVE SUMMARY

The Victorian Health Promotion Foundation (VicHealth) has identified physical activity as one of its priority health areas for promotion in Victoria over the next five years. This report provides background information for the development of strategic directions for the promotion of physical activity in Victoria. In particular, it provides important information about the range of potential strategies for promoting and intervening on physical activity. This information is based on published evidence about approaches to promoting physical activity that have been successful in Australia and internationally. In addition, the potential of other strategies that have not yet been applied to the promotion of physical activity, (but to other health behaviours) is considered. The application of these strategies to different population sub-groups is an important consideration.

This report is written within a public health framework. As such, the physical activity strategies identified are designed not only to shift physical activity behaviours in individuals, but also to achieve shifts in the prevalence of physical activity at a population level. Therefore the recommended strategies to be adopted in the promotion of physical activity in Victoria can be broadly classified as: population approaches and individual approaches.

In Victoria, approximately half of the total adult population is insufficiently active for the accrual of health benefits. The recent national physical activity guidelines recommend that adults should participate in at least 30 minutes of accumulated moderate-intensity activity (e.g. walking) on most days of the week. These new recommendations, adapted from the US Surgeon General's Report on Physical Activity and Health and from the Centers for Disease Control and the American College of Sports Medicine, enable a broader application of these guidelines to the general population. Hence, they are more likely to be achievable for sub-groups such as older adults, minority groups, and other target groups.

The two main approaches that have been adopted both in Australia and internationally to promote physical activity are: population approaches (policy and environmental strategies, and mass media); and individual approaches (print- and web-based, counselling and screening, theoretical models that underpin promotion activities). These approaches can also be applied within different settings of physical activity such as schools and the workplace. In addition to these, other health promotion which have been applied to other public health issues have the potential to also change physical activity behaviour at population and individual levels.

Of the population approaches to promote physical activity, it is clear that there are many independent and government health organisations in Australia that have recently developed physical activity policies and recommendations. The impact of these policies on physical activity behaviour and prevalence is yet to be evaluated. However, as many of the theoretical paradigms suggest, without the support of public policy, it is less likely that population-wide behaviour change will be achieved. As yet, there is little evidence of the success of environmental strategies for the promotion of physical activity in Australia. This is largely due to the nature of research that has been published to date being mainly qualitative and descriptive. However, these studies suggest that this is an area with much promise, particularly with the potential for long-term sustained behaviour change. The use of mass media to promote physical activity in Australia has met with modest success. However, this strategy may have greater success if targeted to particular sub-groups and if supported with other population, environmental, and even individual approaches. The promotion of

physical activity messages through sponsorship or product labelling (guided by health promotion policy initiatives) has not been previously trialed in Australia and may be a promising approach, particularly when it is used to support mass media approaches.

Many studies have used settings to promote physical activity in Australia. Interventions have been conducted in community settings, workplace settings, school and university settings. However, within these settings most of the strategies to promote physical activity have employed individual methods of behaviour change. In addition, although many of the interventions have demonstrated short-term success, few intervention studies evaluated long-term effects, and those studies that did find weak evidence of long-term maintenance of behaviour change.

A small number of international studies have employed relatively new approaches in environmental and policy changes to promote physical activity. As these are long-term strategies, there is, as yet, insufficient evidence of the effectiveness of these approaches in reaching large sections of the population and in achieving lasting behaviour change. It is believed that policy and supportive environments have greater potential to reach larger portions of the community than individual approaches, and also to support sustained behaviour change. However, since behaviour modification is the most effective method for achieving initial behaviour change in individuals, modification of individual behaviours should be used in combination with environmental and policy approaches. The effectiveness of the delivery of individual approaches, such as using computer-mediated systems, still needs to be assessed. Nevertheless, this is a means of physical activity promotion with considerable promise.

Findings from international mass-media campaigns have revealed high awareness (generally around 70% for a televised campaign), increased knowledge, and more positive attitudes to physical activity. Some campaigns resulted in small increases in the population prevalence of physical activity, and also reported increases in individual participation; however, these were generally not sustained for more than a year. Mass media campaigns are most likely to achieve changes in individuals who are at a stage of motivational readiness for physical activity. Therefore, they are likely to be most effective for targeting those segments of the population who are in the precontemplation or contemplation stage of change for physical activity.

A number of international physical activity promotion interventions have been implemented in community, workplace, and educational settings. Large-scale community interventions have generally achieved only modest increases in physical activity within these communities. However, these projects mainly used mass media, combined with individual approaches, to achieve behaviour change. Environmental and policy approaches have not been effectively employed within community settings. These approaches, combined with mass media and individual behaviour change approaches may be the most effective means for increasing adoption and maintenance of physical activity. Interventions focused on special sub-groups (e.g. older adults, ethnic minority groups) within communities have also demonstrated greater success compared to those with a broader focal point. Thus different approaches may be more effective for different sub-groups. Further, individual differences within these sub-groups may require tailored approaches.

Some modifications to general physical activity promotion strategies may be needed to successfully reach different sub-groups, defined by age group, sex, socioeconomic status (SES), ethnicity and for those living in rural and regional areas. Studies of SES have found that the promotion of leisure-time physical activity

in blue-collar workers is not feasible as these individuals generally have adequate levels of occupational physical activity. Mass media approaches have been found to reach higher SES groups more effectively than lower SES groups. Studies of particular age groups indicate that priorities, responsibilities, and also functional capabilities vary and that strategies to promote physical activity need to reflect changes across the lifespan. Studies of women from non-English speaking backgrounds indicate that these women benefit from individually-tailored programs that include social support, provision of programs in different languages, and culturally-sensitive activities.

The development of promotional strategies that target more than one health behaviour is an approach that has often been used in health promotion. In particular, areas like physical activity and nutrition have common health outcomes such as the reduction of overweight and obesity. More recently, strong links between physical activity promotion and injury prevention have been developed. Evidence of links with other health areas such as mental health, smoking, alcohol, and sedentary behaviour are not as strong compared with the evidence of links between nutrition, physical inactivity and obesity. However, increasing numbers of interventions and health promotion strategies are now focusing on multiple lifestyle risk factors, particularly within contained settings such as the work environment. Where there are clear links across health behaviours, it would be useful to combine approaches and achieve more value for money and endeavour.

In summary, international and Australian studies promoting physical activity demonstrate that no single approach has succeeded in effecting long-term physical activity behaviour. To date, most physical activity interventions have focused on the individual, and without supportive environments, it has been argued that physical activity behaviour is less likely to be maintained. Thus, multi-level, multi-strategy approaches that emphasise combined environmental, policy, and individual strategies are likely to have the most potential in initiating and sustaining physical activity behaviour change. Although this type of approach would require support from all levels of society, and substantial infrastructure support, it has the greatest likelihood of achieving long-term sustainability. Furthermore, this approach offers the greatest potential for implementing the National Physical Activity guidelines. There is potential for VicHealth to take a leadership role in this area, especially if it adopts a firm evaluation strategy to accompany any physical activity initiative.

SUMMARY OF RECOMMENDATIONS FOR THE PROMOTION OF PHYSICAL ACTIVITY

Multi-level, multi-strategy approaches that emphasise combined environmental, policy and individual strategies are likely to be the most effective in promoting sustained increases in physical activity in the population. There is strong evidence to support the following strategies:

- Sign postings to promote stair use
- Individual approaches using behavioural strategies such as goal-setting and self-monitoring of behaviour
- Individual print-based and settings-based approaches based on theoretical models of behaviour change including the Theory of Reasoned Action, Transtheoretical Model, and/or self-efficacy and decision-making constructs
- Stage-based, motivationally-targeted interventions
- Combined group- and home-based settings
- Workplace settings approaches incorporating individualised counselling, feedback, health screening, exercise prescriptions and incentives for participation
- School settings approaches including classroom physical education sessions, trained specialists/teachers, behaviour-based curriculum, peer involvement, programs combining multiple strategies
- Improvements in urban design, access and availability (including transport planning); improvements to exercise facilities e.g. walking tracks that are safe, clean, attractive and are purposeful.

SUMMARY OF RECOMMENDATIONS FOR FURTHER STUDIES TO PROMOTE PHYSICAL ACTIVITY

There is emerging evidence for studies to further consider the following:

- Systematic evaluation of the effectiveness of environmental and policy approaches in target versus comparison populations
- Altering the physical environment to be more conducive to recreational physical activity (eg, provide convenient indoor and outdoor facilities, walking/bike tracks, parks)
- Altering the physical environment to be more conducive to physical activity for transport (eg improved safety of commuter routes; provide walking/bike tracks; restrict motor vehicle traffic; increase access to public transport)
- Financial, lottery, and other incentives for active participation (eg reduced health insurance premiums)
- Workplace incentives to promote physical activity (eg supportive environments with shower facilities, bicycle racks etc; release time policies for workplace physical activity)
- Intersectoral approaches (eg government agencies, urban planning, transportation)
- Mass-media approaches targeted to specific sub-groups
- Multi-factor focus, combining physical activity promotion with other health messages (eg healthy eating, smoking, alcohol), using either environmental, mass media and/or individual approaches in different settings
- Use of information technologies, such as web-sites and email
- Environmental, policy, mass media and individual strategies with theoretical underpinnings (eg Transtheoretical Model; Social Cognitive Theory; Ecological models)
- Informational approaches such as health practitioner counselling and/or telephone-based counselling/ automated telephone-delivered health advice
- Use of different settings for physical activity promotion (eg higher education setting, home)
- Promotion of physical activity to diverse population groups, considering individual and group differences (eg sex, age, SES, ethnicity, rural dwellers) eg using mass media, screening programs, workplace programs, and addressing relevant barriers to participation (eg sociocultural and linguistic barriers for ethnic groups)
- Development of strategies to promote physical activity throughout the lifespan and through key life events (eg leaving school, marriage, childbirth, retirement)
- Development of multi-social setting activities e.g. exercise for mothers whilst they are waiting for their children at sport
- A greater understanding of indigenous populations and their attitudes, barriers, determinants and patterns toward physical activity
- A greater understanding of barriers toward physical activity such as injury

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METHODS

Literature for this report was obtained by searching the following electronic databases: WebSpirs (including Medline, Psychlit, Sportsdiscus); Infotrack; Ebsco; and AusportMed. Other information sources included experts in the field, personal resources (journals and books), back referencing from journal articles and text-books, world wide web-based searches, and electronic journal alert services. Keywords used in the literature search included: physical activity and policy, environment, mass media, schools, community initiatives, workplaces, health promotion, SES, women, ethnicity, children, elderly, middle age, sedentary behaviour, television viewing, safety, obesity/overweight, children, mental health, alcohol, smoking.

The most recent review papers (from 1995 onwards) were gathered on international studies on the promotion of physical activity. A search for newly published studies that were not contained in the review papers was performed. For example, the most recent thorough review of studies of physical activity promotion in workplaces was by Dishman (1998), thus databases were searched for new published studies from 1998 onwards.

TABLE OF DEFINITIONS

Physical activity	Movement of the body by the contraction and relaxation of skeletal muscles resulting in increased energy expenditure above the resting level.
Health-related physical activity	Defined as participation in moderate-intensity physical activity for at least 30 minutes (may be accumulated in 3x10 minute sessions) on most days of the week, OR can also be defined as energy expenditure greater than 800kcal* per week.
Physical activity for cardiovascular fitness	Defined as participation in vigorous-intensity physical activity for at least 20 minutes, three times per week or more, OR energy expenditure greater than 1600kcal (including 60 minutes of vigorous-intensity activity) per week.
Physical fitness	A potential outcome of any type of physical activity if it is performed at a sufficient intensity, frequency and duration. It is usually defined as being able to carry out daily tasks comfortably and independently without undue fatigue
Health-related fitness	Includes cardiovascular and muscular endurance, muscular strength, flexibility, and body composition
Performance-related fitness	Includes muscular power, speed, agility, balance, and reaction time
Functional fitness	Refers to the ability to be able to function in everyday living such as tasks involving personal care. The latter is of specific relevance to older age groups
METS	Metabolic equivalent units. These are defined as the energy expenditure required to perform behaviours where sitting resting, is allocated 1 MET (1kcal · [body weight] kg ⁻¹ · hr ⁻¹). Moderate activity such as walking briskly is given a value of 3.5-4 METS.
Physical inactivity	A lack of physical activity behaviour. Also defined as low levels of energy expenditure (<50kcal/week).
Structured/planned physical activity	<i>Exercise</i> and <i>sport</i> are two sub-components of physical activity that are structured or planned and repetitive behaviours, often for the purpose of improved or maintained physical fitness and social benefits.
Incidental physical activity	Includes unstructured and unplanned physical activity where the primary goal is often not physical activity, but some other objective (e.g., walking to the letterbox to post a letter).
Sedentary behaviour	Refers to behaviours that require low METS to perform (1-2 METS) such as watching television, using a computer, reading, etc. These behaviours can occur during leisure-time, at work, at home, in transportation.

CHAPTER 1: INTRODUCTION

OVERVIEW

This chapter briefly describes the scientific evidence for the relationship between physical activity and health. The most frequently used terms in the study of physical activity will be defined in this chapter, and the need to consider physical activity as a public health issue will also be discussed.

1.1 DEFINING PHYSICAL ACTIVITY AND INACTIVITY

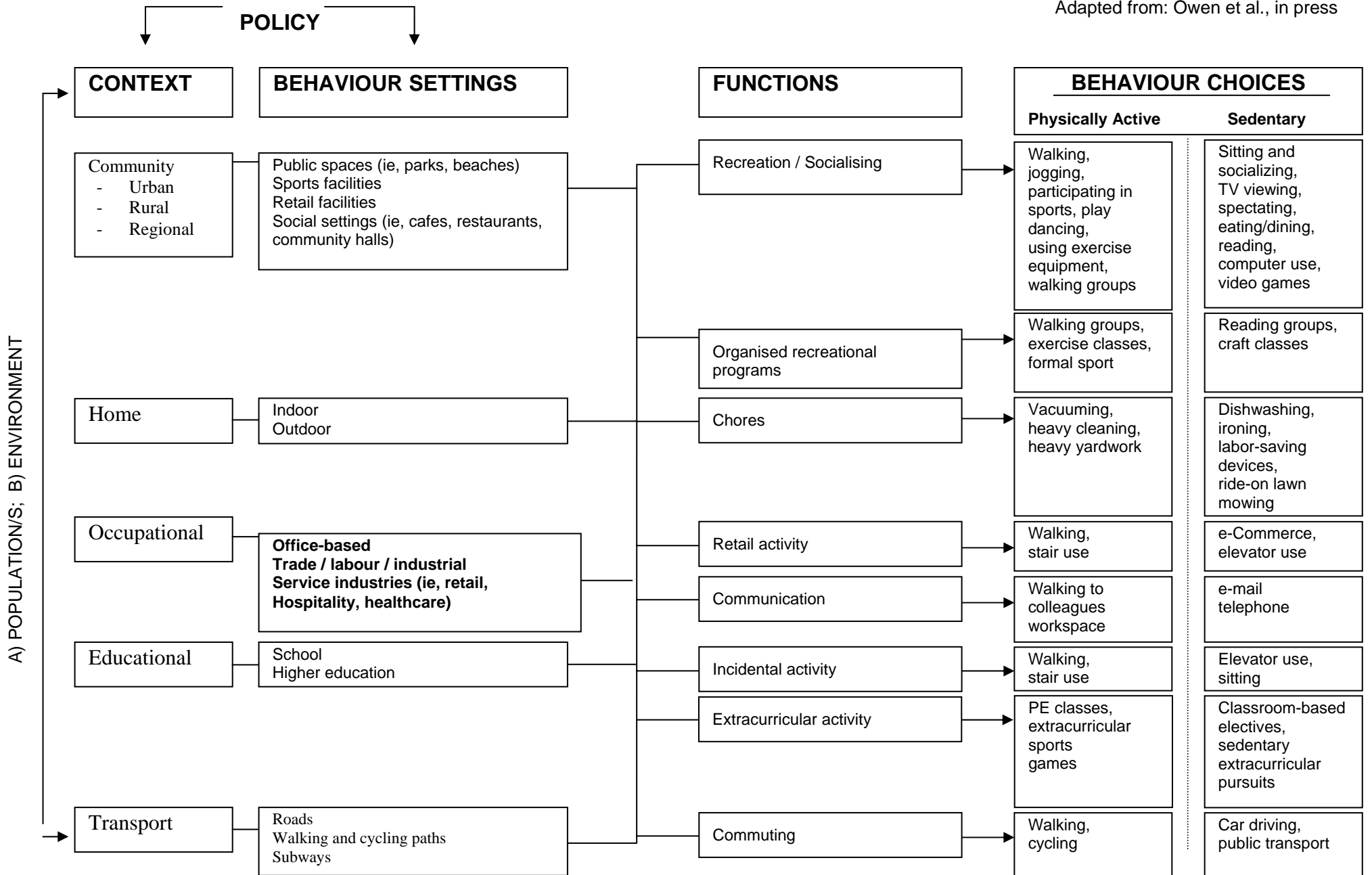
As with any public health issue, it is important to clearly define terminology from the outset. According to the US Surgeon General's Report of Physical Activity and Health (USSGR), *physical activity* can be defined as "bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level" (United States Department Health & Human Services, 1996, p.20). The term physical activity can be conceptualised not just as energy expenditure above the basal metabolic rate, but as a group of active behaviours that can be varied and complex. Examples of active behaviours are cycling, swimming, walking, sweeping, or digging in the garden. The different forms or types of physical activity can be grouped depending on the purpose or intent in performing the activity, such as *exercise* or *incidental physical activity*.

Exercise and *sport* are sub-components of physical activity that are structured or planned and are repetitive behaviours, often for the purpose of improved or maintained physical fitness and recreation (Caspersen, Powell & Christensen, 1985). *Incidental physical activity* can be defined as unstructured physical activity that is not performed as a primary goal or purpose, but rather as a secondary event or incidental outcome that accompanies a particular task or behaviour. For example, a primary goal may be to post a letter of which the incidental outcome is walking to the letterbox. Exercise and incidental physical activity are just two of many types of activity that may occur in a variety of contexts and settings (Figure 1).

Figure 1 provides a model of potential influences on physical activity or sedentary behaviour choices in a variety of behaviour settings (Owen, Leslie, Salmon & Fotheringham, in press). Behaviour setting can be defined as the physical or social settings in which physical activity can occur. Physical activity policy may be implemented at the contextual and/or behaviour setting level, however, the influence of the environment cuts across all levels from context to individual behaviour choice. Population differences may also be found across all of these levels.

Figure 1: An environmental and policy framework of potential influences of behaviour settings and their functions on physically active and sedentary choices.

Adapted from: Owen et al., in press



When defining physical activity it is also important to consider the intensity of the activity. *Intensity* can be defined based on the maximal heart rate achieved during the physical activity episode. For example, *vigorous-intensity* physical activity would require elevating the heart rate to 75-85 percent of the maximal heart rate, while *moderate-intensity* activity would require elevating the heart rate to 65-75 percent of the maximal heart rate. Other definitions of intensity, such as a verbal or written illustration can be used. Moderate-intensity activity is often defined as equivalent to a brisk walking pace, and vigorous-intensity activity is often defined as equivalent to jogging, or activity that makes you 'puff and pant' (Department of the Arts, Sport, the Environment and Territories (DASET), 1992; Pate, Pratt, Blair, Haskell, Macera, Bouchard et al., 1995; Booth, Owen, Bauman & Gore, 1996a; Booth, Owen, Bauman & Gore, 1996b; Gore, Booth, Bauman & Owen, 1999). Intensity can also be quantified in terms of metabolic equivalents (METs), which are units used to describe the metabolic cost of the physical activity as a product of the resting metabolic rate (1 MET) (Montoye, Kemper, Saris & Washburn, 1996; Ainsworth, Haskell, Leon, Jacobs, Montoye & Sallis, 1993). Moderate-intensity activity is equivalent to approximately 3-6 METs or "3 to 6 times as much energy as rest" (Sallis & Owen, 1999, p.10), and vigorous-intensity activity is equivalent to approximately 7 METs or more, requiring "7 times as much energy as rest, or greater" (Sallis & Owen, 1999, p.10).

The converse to physical activity is physical inactivity. *Physical inactivity* consists of a lack of active behaviours and can be defined by the low levels of energy expenditure involved. For example, an energy expenditure of <50kcal/week represents a low level of energy expenditure, and is classified as 'inactive' in terms of physical activity guidelines (Bauman, Bellew et al., 1996).

People who are physically inactive participate in *sedentary behaviours*, such as TV viewing, that can be classified by energy cost. It has been argued that time spent in sedentary behaviours may result in decreased overall energy expenditure, and significantly, increase people's risk of overweight and obesity and associated poor health outcomes (Dietz, 1996). Sedentary behaviours can be clearly identified by the amount of energy required to perform them. Where a resting metabolic rate is equivalent to one MET, sedentary behaviour may be defined as having a MET value between 1-1.5 (i.e. equivalent to sitting or lying down) (Ainsworth et al., 1993; Montoye et al., 1996).

Physical fitness is a potential outcome of any of the types of physical activity described in Figure 1 if they are performed at a sufficient intensity, frequency and duration. Physical fitness is usually defined as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies" (USDHHS, 1996, p.20). A further distinction has been made between *health-related* fitness, which includes cardiovascular and muscular endurance, muscular strength, flexibility, and body composition; and *performance-related* fitness, which includes muscular power, speed, agility, balance, and reaction time (Caspersen et al., 1985; USDHHS, 1996; Sallis & Owen, 1999) and *functional fitness*, which refers to the ability to be able to function in everyday living such as tasks involving personal care (USDHHS, 1996). The latter is of specific

relevance to older age groups. Health promotion strategies to increase physical activity levels aim to improve levels of health-related fitness in populations.

1.2 THE HEALTH CONSEQUENCES OF PHYSICAL ACTIVITY AND INACTIVITY

The health consequences of physical activity and exercise have been extensively studied. In particular, epidemiological studies of physical activity and health have drawn comparisons to the activity levels of people who have (or further develop) diseases, and those who do not (USDHHS, 1996). Compared to those who are inactive, people who are moderately or vigorously active have been found to be significantly less likely to suffer premature all-cause mortality; cardiovascular diseases (CVD) such as coronary heart disease (CHD), stroke, and high blood pressure; colon cancer; non-insulin dependent diabetes mellitus (NIDDM); and osteoarthritis (USDHHS, 1996). Although it is commonly believed that low levels of physical activity and low total energy expenditure are responsible for weight gain (Prentice & Jebb, 1995; Wiseman, 1996), there are few data available that provide conclusive evidence of this. Nevertheless, physical activity has been shown to play an important role in weight control by promoting fat loss while retaining or increasing lean mass (Garrow & Summerbell, 1995; Grilo, 1995; World Health Organisation (WHO), 1997;).

Early studies of the health consequences of physical activity compared people working in vigorous or physically demanding occupations to those in more sedentary occupations. For example, in the 1950's a study of the frequency of heart disease in bus company employees in London compared conductors to drivers and found the drivers to be significantly more at risk of CVD factors (Morris, Heady, Raffle, Roberts & Parks, 1953). Similarly, a study of US white male railroad employees found that clerks were two times more likely to develop CVD compared to switchmen whose occupations were physically harder (Taylor, Klepetar, Keys, Parlin, Blackburn & Puchner, 1962). Another longitudinal study of male employees in the US assessed the incidence of CHD deaths in longshoremen, and found workers whose occupations required the least energy output to be significantly more likely to die from CHD compared to workers with high energy outputs (Paffenbarger & Hale, 1975).

A study of US male college alumni was one of the first to examine the effects of leisure-time and incidental forms of physical activity on the incidence of CHD (Paffenbarger, Hyde, Wing & Hsieh, 1986). Since that study, the majority of epidemiological studies examining the health consequences of physical activity have assessed only leisure-time physical activity (USDHHS, 1996). This is a serious limitation in that people that also participate in physical activity in other contexts and settings. It is tacitly believed that technology has rendered occupational energy expenditure levels to a minimum across all levels of job classification (Blair, Booth, Gyrfas, Iwane, Marti, Matsudo et al., 1996; Rutenfranz, Ilmarinen, Klimmer & Kylian, 1990; Leon & Blackburn, 1983). There is little formal evidence to support this and such an insidious change may be difficult to demonstrate. In addition, physical activity around the home has been overlooked, possibly as men were typically the focus of the majority of early physical activity studies. It is only more recently that females have been target populations in physical activity studies (e.g. Weller & Corey, 1998).

The strength of the association between physical activity, inactivity and health is apparent despite the considerable variability in the published studies methodologies. Approximately 55 published studies reviewed in the US Surgeon General's Report (USDHHS, 1996) found some dose-response relationship between physical activity and mortality or morbidity. This is despite the diversity in the types of physical activity assessed (i.e., occupational, leisure, household) and the wide variation in the physical activity measures used. Studies that have assessed cardiorespiratory fitness as an indirect measure of physical activity have also found the former to be strongly associated with health outcomes (Blair, Kohl, Paffenbarger, Clark, Cooper & Gibbons, 1989; Blair, Kohl, Barlow, Paffenbarger, Gibbons, Macera, 1995; Bauman & Owen, 1999).

Functional fitness, whereby individuals are able to perform activities for everyday living, is also important. For example, functional fitness is important for the elderly in being able to perform such activities as getting up out of a chair, or getting dressed. Fitness in older adults is therefore of particular concern, as this group is over-represented in the proportion of the Australian population that are insufficiently active to accrue health benefits (Jones & Owen, 1998).

Regular physical activity has been identified as an important consideration in the maintenance and improvement of physical health and well-being. In addition to physical health benefits, a number of psychological benefits have been associated with regular physical activity in adults (Brown et al., 1999; Fisher et al., 1998). Examples of psychological benefits from regular physical activity include: enhanced mental performance and concentration levels; improvements in mood, sleep, energy levels, tension and stress levels; and decreased feelings of anxiety, hostility and depression. The range of psychological benefits gained from physical activity have major public health implications, in terms of both mental health, and achieving potentially difficult long-term adherence to exercise, necessary for achieving significant health benefits (USDHHS, 1996).

The evidence linking physical activity and inactivity to health has resulted in health authorities acknowledging the need to develop strategies for increasing physical activity and decreasing inactivity in the population (USDHHS, 1996; Pate et al., 1995; Commonwealth Department of Human Services & Health (CDHSH), 1994; Killoran, Fentem & Caspersen, 1994). In 1994, Australia's national objective was to reduce the rate of physical inactivity to approximately 25% by the year 2000 (CDHSH, 1994). A 1989 National Health Survey found that 36% of adults in Australia were physically inactive (Australian Bureau of Statistics (ABS), 1995a). More recent figures (see Table 1.1) indicate that approximately 12% of the adult population is inactive in NSW (Bauman et al., 1996), 12% in Victoria (Smith et al., 1999), and 8% of the population to be inactive in South Australia (Owen et al., 2000). However, changes in physical activity measures and the domains of activity being assessed make conclusions about physical inactivity trends difficult. Table 1.1 shows the prevalence of physical activity in Victoria and Australia, for men and women aged 18 years and over.

To adequately monitor the population prevalence of physical activity and inactivity, and also to continue to assess associated health consequences, it is important to have reliable and valid measures to assess physical activity. Australia is currently working with a number of

international agencies (e.g. the World Health Organisation) towards developing standardised measures of physical activity to promote consistency within and across countries and to enable international comparisons of physical activity rates.

Table 1.1: Prevalence of physical activity in Victoria and Australia

	Men	Women
Victoria (Smith et al., 1999)		
Inactive	12%	12%
Low	22%	39%
Moderate	31%	29%
High	35%	20%
Victoria (ABS, 1999)		
Walking for exercise	14%	32%
Swimming	12%	15%
Golf	15%	4%
Aerobics	8%	15%
Cycling	10%	5%
Tennis	8%	8%
Total participation in sport and physical recreation	61%	55%
Australia (ABS, 1999)		
Walking	16%	30%
Swimming	14%	17%
Golf	16%	4%
Aerobics/fitness	8%	14%
Cycling	7%	5%
Running	7%	3%
Total participation rates	63%	56%

1.3 NATIONAL PHYSICAL ACTIVITY RECOMMENDATIONS, GOALS AND TARGETS

The Centers for Disease Control and American College of Sports Medicine (CDC/ACSM) recommend that a level of physical activity sufficient for reducing the risk of morbidity and premature mortality from a range of diseases (e.g., CVD, NIDDM) requires accumulation of at least 30 minutes of moderate-intensity physical activity 5-7 days per week (Pate et al., 1995). Each 30-minute session could consist of a single bout of activity or an accumulation of 8-10-minute multiple bouts of activity (Pate et al., 1995). Moderate-intensity activity was defined as a brisk walking pace, equivalent to approximately 3 METS, which translates to about 800 kcal of energy expended in physical activity per week.

There is some evidence that multiple bouts of physical activity of short duration result in increases in physical fitness and changes in body composition similar to the effects of single bouts of longer duration (e.g. DeBusk et al., 1990; Ebisu, 1985). However, these findings are based on experimental studies incorporating small select groups of men (e.g., college students). There are also observational data that show a lower mortality and morbidity rate with participation in activities that are *usually* intermittent in nature such as housecleaning and stair climbing; however, the duration and frequency of these types of activity necessary to achieve related health benefits are not clear (Weller & Corey, 1998). The CDC public health physical activity recommendations have been endorsed by the US Surgeon General (USDHHS, 1996), and are also reflected in the UK (Killoran et al., 1994; Fentem, 1996).

In Australia, national physical activity guidelines were released in 1999 (Commonwealth Department of Health & Aged Care, 1999). These guidelines are summarised in Table 1.2. In addition, a national physical activity framework, *Active Australia* (www.ausport.gov.au/partic/), has been developed to provide a means for collaborative strategies to promote physical activity (Bauman et al., 1996; Australian Sports Commission, 1997; Public Health Association of Australia, 1999; Commonwealth Department Health & Family Services, 1998). *Active for Life*, the Victorian State Government Department of Human Services' key physical activity initiative, has also adopted the *Active Australia* recommendation of 30 minutes of moderate physical activity a day (Victorian Department of Human Services, 1999; Smith et al., 1999).

Table 1.2: Physical activity guidelines for Australia

• Think of movement as an opportunity, not as an inconvenience
• Be active every day in as many ways as you can
• Put together at least 30 minutes of moderate-intensity physical activity on most days, preferably all days
• If you can, also enjoy some regular, vigorous exercise for extra health and fitness

(Source: Commonwealth Department of Health and Aged Care, 1999)

1.4 CONCLUSIONS

In summary, this chapter presents an overview of the scientific evidence of the public health importance of physical activity. In Victoria, approximately half the adult population is insufficiently active for the accrual of health benefits (Smith et al., 1999). The recent National physical activity guidelines recommend that adults should participate in at least 30 minutes of accumulated moderate-intensity activity (e.g., walking) on most days of the week. These new recommendations, adapted from the US Surgeon General's Report (USDHHS, 1996) and from CDC/ACSM (Pate et al., 1995), enable a broader application to the general population and will be more achievable for sub-groups such as older adults, minority groups, and other target groups. Strategies that can be used to promote these recent physical activity guidelines shall be reviewed in the following chapter.

CHAPTER TWO: POTENTIAL APPROACHES FOR THE PROMOTION OF PHYSICAL ACTIVITY

OVERVIEW

The health literature describes a number of different approaches to health promotion (Hawe, Degeling & Hall, 1995; Perkins, Simnett & Wright, 1999). Whilst some of these approaches have been commonly used in physical activity promotional strategies, others have been infrequently applied to the physical activity area to date, despite their value. This chapter provides a broad overview of the different types of health promotion strategies that may be usefully applied to the promotion of physical activity in adults, children and other at-risk sub-groups in the population. These strategies will be categorised into two main types: population and individual. Strategies to achieve changes in populations include environmental, policy, and mass media approaches. Strategies to achieve individual behaviour change include print and web-based approaches, screening and counselling. These strategies are often based on theoretical models of individual behaviour change.

2.1 POPULATION APPROACHES

Supportive environments and public policy are two broad strategies that will be considered in this section, as these have the greatest potential for physical activity. With the current emphasis on incorporating physical activity into one's lifestyle and increasing bodily movement or energy expenditure, the promotion of physical activity within a public health framework requires the use of approaches that will reach large segments of the population (Owen, Leslie, Salmon, Fotheringham, 2000). There are clear advantages to organising health promotion and other components of public health around population sub-groups who are at risk of developing diseases. Information on the health status of population groups is collected on a consistent and occasional basis by governments at national, state and local levels, and various other bodies including the National Heart Foundation, cancer organisations and universities. This information could be used to establish priorities and guide the development of physical activity and other health promotion initiatives, including changes in community resources, public health campaigns and education programs to facilitate and influence the factors contributing to the health and level of activity of specific population subgroups.

The association between physical activity and health, plus the modest population prevalence of physical activity sufficient for health gain, have led health authorities to emphasise the importance of promoting increased levels of physical activity (USDHHS, 1996). The World Health Organisation has identified the need for a multi-level approach to health promotion that acknowledges the important role that the environment and public policy has on health (Ottawa Charter, 1986). Literature from the past decade suggests the need for supporting environmental

and policy interventions. These types of interventions have considerable potential for promoting physical activity, because they are designed to have an impact on large groups and populations (Sallis et al., 1998). Changes in policy and the environment have also been shown to support and sustain changes in individual behaviour (Farquar, 1978). Despite this, few published studies of environmental and policy interventions exist. Previous studies using these interventions have mainly been directed towards smoking cessation and the reduction of cardiovascular risk factors (Schmid et al., 1995). Environmental and policy interventions aimed at increasing physical activity at a population level have only recently emerged in the scientific literature.

The application of behaviour models and theories to the promotion of physical activity at a population level is useful for understanding why people do or do not participate in physical activity. These will be described in this chapter and provide important information for the development of strategies to increase physical activity. There are a number of theoretical models that provide a potentially viable framework for better understanding physical activity and inactivity at a population level (Sallis & Owen, 1999). Some of these have been applied to physical activity studies and will be reviewed in the following chapters.

2.1.1 ENVIRONMENTAL AND POLICY STRATEGIES

Policies may be defined as laws, regulations, formal and informal rules and understandings that are adopted on a collective basis to guide individual and collective behaviour (Wallack, 1990). They may be viewed in terms of legislation and organisational policy. Legislation includes formal, documented policies that influence laws enacted by relevant governing bodies. The enforcement of seat belt laws is an example of public health based legislation. According to Schmid and colleagues (1995) organisational policies are policies implemented within specific organisations that define and establish appropriate behaviour within the realms of the organisation. They have been shown to have a significant impact on public health. For example, smoking prevalence have been found to be reduced in smoke-free schools and other public smoke-free localities (Schmid et al., 1995); current Victorian legislation is introducing smoking bans in restaurants and eateries. Clearly, legislative approaches will only be effective when the legislations are enforced.

Environmental strategies used in health promotion involve change in both the social and physical environment and address availability, accessibility and social norms (Schmid et al., 1995). An example of a successful environmental intervention includes the opening of gymnasiums and swimming pools before and after business hours, which may lead to an increase in physical activity by increasing accessibility. Policy initiatives have the potential to create changes in the environment that increase access to, and support physical activity (Sallis and Owen, 1998). Environmental changes can have a broad impact on populations and are less costly and more lasting than education based programs. Evidence of this has been shown in the ecological principles used to guide the development of physical activity promotion policies in Australia and England (Owen & Lee, 1989; Owen, 1994; Sallis & Owen, 1999). These types of

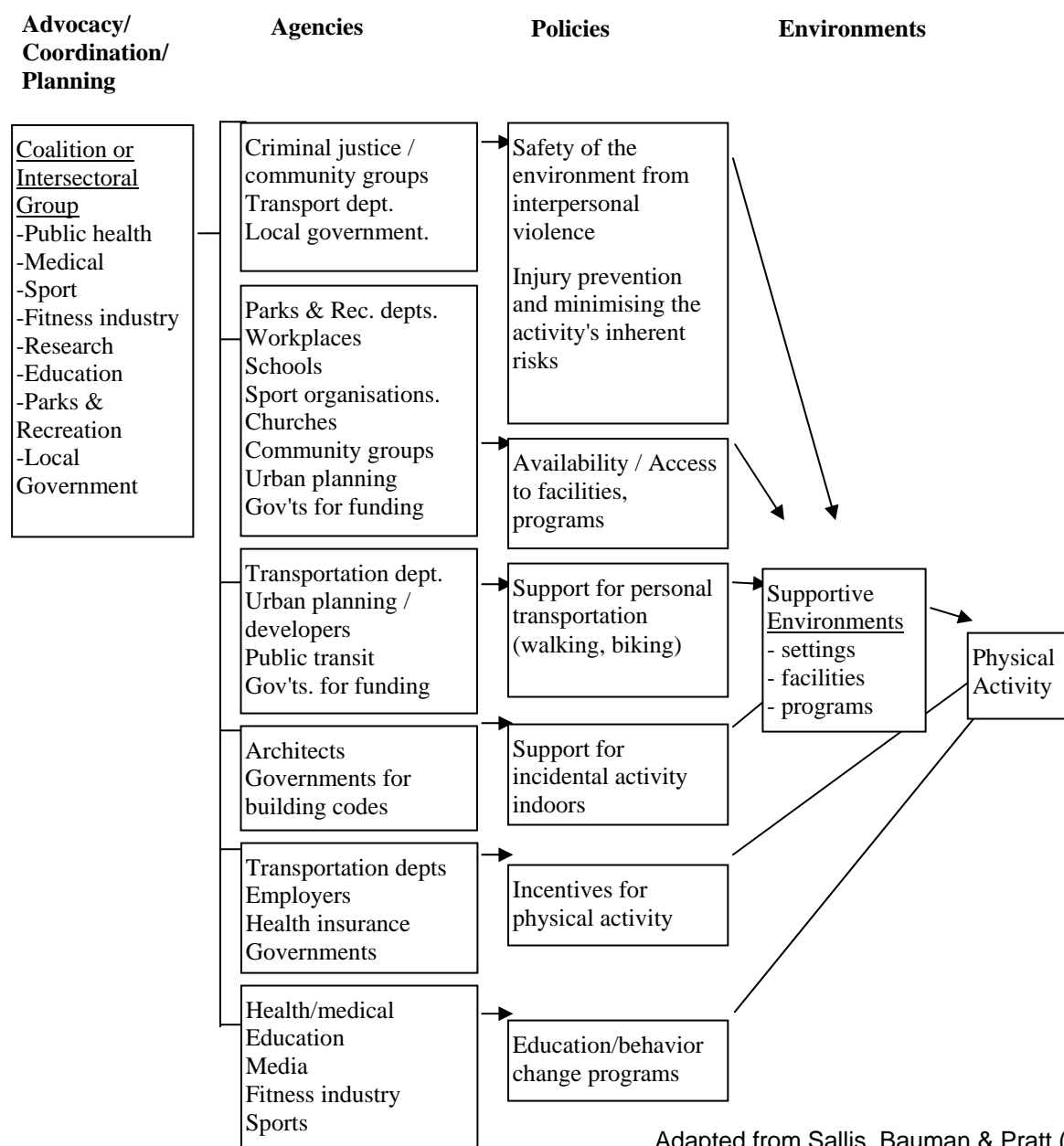
interventions use the strength of law and regulation to change behaviour and social norms, as opposed to achieving change by individual remediation (Schmid et al., 1995).

Approaches that have been endorsed in several physical activity and obesity public health policy statements (USDHHS, 1996; Killoran et al., 1994; CDHHS, 1994; National Health and Medical Research Council (NHMRC), 1997; World Health Organisation (WHO), 1997), are the consideration of environmental and policy issues to affect public health concerns such as inactivity, overweight, and increasing physical activity. In behavioural epidemiology, theories or models are often used to better understand adoption of behaviours of interest (Sallis & Owen, 1999). The following section provides an overview of theoretical models that may provide a better understanding of participation in increasing physical activity at a population level.

Few studies have evaluated the effectiveness of environmental and policy interventions. Sallis and colleagues (1998) provided a conceptual model of how these interventions could be implemented at a macro-level. Figure 2 has been adapted from the NSW Physical Activity Taskforce (Bauman et al., 1996). The model proposes four levels for policy and environmental physical interventions: advocacy, coordination and planning; agencies; policies; and environments.

The most relevant sectors for advocacy, coordination and planning of interventions to promote physical activity include public health, medicine, education, recreation departments, sports organisations, and the fitness industry (Sallis et al., 1998). In some instances, transportation, urban planning and local government agencies may be critical members of the planning group. Not all groups will wholly adopt the health related goal of increasing physical activity, however, they may have compatible goals. For example, transportation organisations may be motivated to reduce car travel by promoting walking and cycling, and local government can be motivated to increase quality of life by creating more supportive walking environments. The emphasis of this model is on creating supportive policies and environments, however it is also acknowledged that educational and behaviour change programs are needed to prompt and enable people to take advantage of supportive environments (Sallis et al., 1998). This model has implications for both research and application purposes, as complex policy and environmental changes need to be planned and implemented before they can be evaluated. Further, the complexity of the interventions demonstrate the need for multisectoral co-operation.

Figure 2: Conceptual model of the development of policy and environmental interventions to promote physical activity



2.1.2 THEORETICAL MODELS AND ENVIRONMENTAL APPROACHES TO UNDERSTANDING HEALTH BEHAVIOUR

Although environmental and policy strategies are identified as having the most potential for physical activity change at the population level, it is necessary to conceptualise and operationalise ways in which these types of strategies can be implemented through the use of theoretical frameworks (Schmid et al., 1995). In particular, programs that have been directed

towards creating supportive environments and highlighting the promise of healthy public policy have been informed by a variety of theoretical models of health behaviour. This section describes promising theoretical models that include environmental and policy factors (see Table 2.1).

One of the broadest behavioural models is social cognitive theory (Bandura, 1986). Social cognitive theory (SCT) emphasises interactions between intrapersonal, social and the physical environment and describe how these influence behaviour (Glanz, 1990). Health programs informed by SCT use techniques that highlight the cognitive mediators of behaviour such as self-efficacy (a person's belief that they can perform a particular behaviour). Other variables have also been found to be useful such as behavioural capability (knowledge and skills to perform a behaviour); outcome expectations (e.g. anticipated outcomes from going for a walk); and situation (a person's perception of the physical environment). As such, the theory not only seeks to explain how people acquire and maintain certain behaviour patterns, but also provides the basis for intervention and learning strategies. Numerous successful behaviour modification intervention approaches have arisen from this theory (Perry, Baranowski, Parcel, 1990).

Another model is the ecological framework which includes the interactions between the individual, and their social and physical environments, and "integrate[s] the community-wide, preventive strategies of public health and epidemiology with the individual-level, therapeutic and curative strategies of medicine" (Stokols, 1996; p.286). Despite ecological models assuming various levels of influence on behaviour, they highlight the effects of social systems, public policy and physical environments (Sallis & Owen, 1999). Unless interactions between the individual, and the social and physical environments are examined within a social paradigm (Stokols, 1992; Stokols, 1996), the causes of mass sedentary behaviour will not be understood, nor will effective solutions to this problem be able to be developed (Sallis & Owen, 1999, p.124). McLeroy and colleagues (1988) identified five sets of factors comprising an ecological perspective as integral to health education and promotion. These include:

- Intrapersonal factors – characteristics of the individual, including knowledge, behaviour, attitudes, self-concept and skills.
- Interpersonal processes and primary groups – formal and informal social networks and support systems, including family, workgroups and friendship networks.
- Institutional factors – social institutions with organisational characteristics and formal and informal rules and regulations for operation.
- Community factors – associations among organisations, institutions and informal networks within defined and established boundaries.
- Public policy – including local, state and national laws and policies.

Table 2.1: Behavioural models and theories applied to physical activity

Theory/Model	Intrapersonal Variables	Social Variables	Physical Environment Variables	Applications in Interventions
Social Cognitive Theory (SCT)	Outcome expectations; Behavioural capability; Self-efficacy	Observational learning; Reinforcement	Situation	Cognitive behaviour modification
Ecological Models	Multiple levels of influence, including intrapersonal	Interpersonal factors; Institutional factors	Community factors; Public policy factors; Health promotive environments	Multilevel approach
Behaviour Choice Models (BCT)	Reinforcement, Preference		Environmental barriers	Laboratory-based

(Source: adapted from Sallis & Owen, 1999)

Behavioural choice theory is a theoretical model that describes interactions between individuals and the environment, and has recently been considered for use in population-based interventions (Epstein, 1998). Behavioural choice theory (BCT) evolved from early laboratory-based studies of animal and human choice behaviour (Tolman, 1938). Behavioural choice theory is defined as “the interaction between a person and the world as a reciprocal relationship”, consisting of external processes such as feedback functions, which are properties of the environment, and internal processes, which are the value or worth of the alternatives (Rachlin, 1989; p.157). Behavioural Choice Theory has been applied in population-based studies to gain a better understanding of time allocation in the choice of sedentary behaviours and physical activity (Salmon, Doctoral Thesis, 1999). Of particular importance is the impact that the environment has on choice of behaviour. For example, the environment may provide prompts or constraints that influence participation in physical activity or sedentary behaviours (Epstein, 1998). One of the strengths of BCT is the versatility with which it can be applied to better understand choice outcomes. Vuchinich (1987) argues that “the concept of reinforcement is a very important notion in most behavioural theories. Reinforcement occurs when the consequences of a given behaviour serve to maintain that behaviour” (1987; p.44). Reinforcement values may be operationalised in a variety of different ways; for example gaining satisfaction in the accomplishment of meeting physical activity goals to achieve a reinforcing consequence such as weight loss (Salmon, 2000).

The theoretical models described in this section are just some of the models with an environmental or policy approach that could be useful in directing the development of strategies to increase physical activity. Other theories that enable a better understanding of individual health behaviour will be described later in this chapter.

2.1.3 MASS MEDIA

Another population approach to health promotion is the use of mass media. Mass media interventions may be defined as those interventions that reach groups of individuals using a medium other than personal contact. They offer a means for reaching large numbers of people for a less per-unit expense than that associated with face-to-face interventions (Flora, 1989). Mass advocacy uses mass media to strategically advance a social or public policy initiative, by directing attention to changing the way a problem is understood as a public health issue. Further, media coverage focuses on the activation of forces within a social system that can help generate public concern and action (Glanz, 1990). To date, mass media interventions for physical activity promotion have not been extensively studied (Marcus, Owen, et al., 1998). Research on print and other media-based interventions has not yet provided extensive data on long-term maintenance of change in physical activity behavior following such interventions. For the impact of such media-based interventions to be maintained, support systems will be required to prompt and support participation over time.

Mass media campaigns, alone, are unlikely to impact significantly on individuals' behaviour; such campaigns to promote physical activity participation in populations need to be combined with programs offered at the community level (Donovan & Owen, 1994). In this way, mass media campaigns can be used to increase awareness and motivation to participate in physical activity, while coordinated community-based programs provide opportunities to participate. Donovan and Robinson (1992) described the roles of mass media in the promotion of physical activity participation as:

- increasing the salience of physical activity as a health issue
- providing information on the health benefits of physical activity
- providing information on the non-health benefits of physical activity
- increasing interest in physical activity participation and sensitising individuals to community-based programs
- motivating individuals to take action towards physical activity participation.

Clearly, different mass media messages will have different influences with different populations. Within a given population, different individuals will have varying levels of interest in physical activity and will find different components of the messages salient to their needs. Recent research has investigated the impact of tailoring mass media messages to the different needs of individuals (Marcus, Owen, et al., 1998). Current understanding is limited about which types of print and other media-based messages are most efficacious. Further, the frequency with which installments of such interventions are optimally delivered is not well understood. The characteristics of people most likely to benefit from media-based interventions, and the forms of

print, electronic or interactive communication media most likely to be effective in promoting physical activity change, are important areas for ongoing investigation.

Donovan & Owen (1994) reviewed the limitations of mass media approaches to increasing physical activity, and integrated behavioural epidemiology concepts with the Social Marketing Model. They report on the importance of the “four P’s” (product, price, place, promotion) to population strategies for physical activity intervention. Further, these same authors use the Transtheoretical Model (Prochaska & Marcus, 1994) to demonstrate how mass media and other related strategies may be applied to individuals who are at different stages of change associated with physical activity.

Theories that recognize the differing levels of motivation, particularly the Transtheoretical Model, can help to guide the design of more effective interventions tailored to the appropriate level of motivation (Marcus, Owen et al., 1998). A consistent finding is that matching material content to individuals' stage of motivational readiness is helpful in media-based interventions (Pate, et al., 1995). A number of studies have reported mass media interventions based on the Transtheoretical Model, and have reported that a significant proportion of their participants progressed toward higher stages of motivational readiness for physical activity adoption as a result of motivationally-tailored interventions. Approaches using varying levels of print information and advice, with a range of other support media were found to be effective in a variety of settings and delivery methods. Indirect contact by telephone, printed self-help materials, and other media-based methods can enhance face-to-face counselling or be effective as sole intervention strategies.

A wide variety of health, fitness, and physical activity messages have been included in broadcast media environments (particularly television) for many years, and fitness and exercise information and advice web-sites are increasingly appearing on the Internet. The delivery of carefully designed, theoretically-based and rigorously evaluated physical activity interventions through websites are in the early stages of development. This new medium has many attributes, capacities and potentials in common with paper-based-print, television and radio broadcast media and personal counselling. There are elements (immediate feedback, and the delivery of small segments of tailored information and advice) which are unique to these new information technology capacities, which need careful evaluation (Fotheringham, Owies, et al., in press).

2.1.4 OTHER HEALTH PROMOTION CAMPAIGNS

Health promotion messages can also be disseminated without the use of mass media. For example, health promotion campaigns may be conducted through product labeling (driven by public health policy initiatives) or through various forms of sponsorship program.

An excellent example is the introduction in the mid-1980s of health warning labels on cigarette packages, and the subsequent introduction in the mid-1990s of tougher, bolder warnings, with explanatory messages including information on contacting quit smoking advice lines. The

regulation of the revised messages included compulsory bold colouring, and require that a minimum of 25% of the package be covered by the warnings (Victorian Smoking and Health Program, 1995). Evaluation studies have indicated high levels of awareness of the messages amongst smokers (Trotter, 1998).

Another well-recognised Australian health promotion message is the use of the National Heart Foundation's (NHF) "Tick program", designed to help individuals make healthy food choices (<http://www.heartfoundation.com.au>). In this program, food products which meet guidelines for heart health are endorsed with a NHF tick logo.

Sponsorship programs are also used to promote healthy behaviour through the endorsement of professional sporting teams and associations. For example, in the Australian Football League, the North Melbourne Football Club is sponsored by the Quit organisation through the "100% Smoke Free" campaign. This sponsorship is directed toward gaining the attention of young people, and is intended to complement mass media-based strategies. Similarly, in the National Basketball League, the Victoria Booze Less Titans have naming sponsorship agreement with the Australian Drug Foundation through VicHealth, to promote safe, moderate consumption of alcohol. Again, this form of sponsorship allows targeting of a health message to an important target audience - young adults.

In summary, there is great potential for changing physical activity levels of entire populations through community-based and mass media programs. To date there is only limited information on the types of large-scale initiatives that are likely to be successful. Many of the programs that have been evaluated have shown limited effects, which may be due to the emphasis on educational approaches that do not provide sufficient ongoing support for change (Sallis & Owen, 1999). Research on population interventions for increasing physical activity is particularly important, as it can be used directly by decision-makers in governments (and in the private sector) to increase physical activity, and thus, improve the health of entire populations.

2.2 INDIVIDUAL APPROACHES

Public health strategies that use population approaches address the need to reduce physical inactivity through changes to both individual behaviour and the environment (King et al., 1995; Sallis et al., 1998). However, most physical activity research has concentrated on increasing physical activity by changing individual behaviour (Dishman & Sallis, 1994). A wide range of health professionals including health educators, medical practitioners and psychologists focus most of their efforts on changing the health behaviour of individuals. Likewise, social workers and nurses contribute to health promotion through their experiences in working with individual patients, groups of patients and their families to facilitate learning and behaviour change (Glanz et al., 1990). Individual approaches target changing behaviour in a particular person, focusing largely on specific biological, cognitive and behavioural variables that may influence their physical activity patterns. Psychological approaches contribute to health promotion by providing

guidance on how to address individual differences, motivation, learning, attitudes, and behaviour change (Matarazzo et al., 1984). To intervene effectively, and to make informed judgements about how to measure the success of interventions, health professionals must have an understanding of the role of the individual in health behaviour (Glanz et al., 1990). This is discussed in more detail in the section 2.2.1.

2.2.1 PSYCHOLOGICAL THEORIES OF INDIVIDUALS' HEALTH BEHAVIOURS

Applying psychological theories to promoting healthy lifestyles has become a major area of research in health psychology and is having a significant impact on health promotion program development and broader public-health policy initiatives (Fotheringham & Owen, 1999). Over the past few decades, formal theories and broader theoretical or conceptual models have been very influential in the development and evaluation of practical health promotion programs (Glanz, Lewis & Rimer, 1996). Theories and models of the determinants and dynamics of health-related behaviours (see Table 2.2) have been used by practitioners and policy-makers to justify, shape and focus many small- and large-scale health promotion efforts (Fotheringham & Owen, 1999).

2.2.1.1 HEALTH BELIEF MODEL

The Health Belief Model (HBM) (Becker, 1974) emphasises the importance of creating behaviour change through cues or prompts to action and minimising the costs of participation of health promoting behaviours, as well as increasing barriers and reducing cues to unhealthy behaviours (Bennett & Murphy, 1997). This model is one of the earliest health behaviour models and was developed to predict participation in screening programs. The Health Belief Model is based on the interaction between a range of aspects of individuals' perceptions, such as personal susceptibility to particular health problems, severity of the health problems, benefits of preventive actions or treatments, cues to action (information and/or prompts that initiate behaviour), and self-efficacy (Fotheringham & Owen, 1999). It is not currently used in health behaviour research, but has led to the development of other theories which are currently used.

2.2.1.2 PENDER'S HEALTH PROMOTION MODEL

Pender's (1987) Health Promotion Model was developed to describe and explain health-enhancing behaviours, as a complement to models of health protection. This model is similar to the early and influential Health Belief Model (Janz & Becker, 1984; Rosenstock, 1990; Rosenstock & Kirscht, 1974), but more clearly defines aspects of this earlier model (de Groot, 1969).

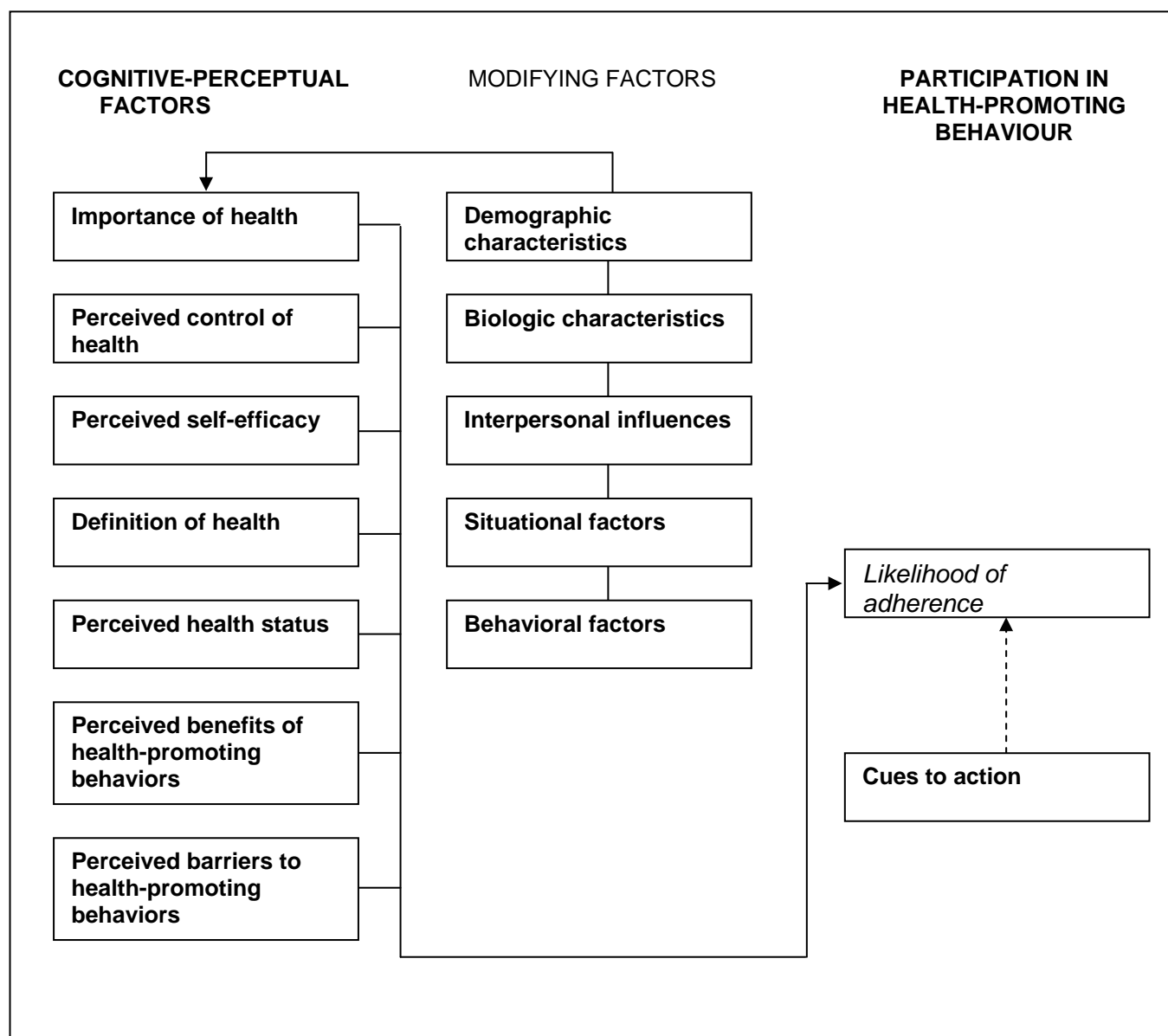
Table 2.2: Individual models and theories applied to physical activity

Theory/Model	Intrapersonal Variables	Social Variables	Applications in Interventions
Health Belief Model	Perceived susceptibility; perceived severity; perceived benefits; perceived barriers; cues to action; self-efficacy		Knowledge-based programs; health education; risk appraisal
Theory of Reasoned Action / Theory of Planned Behaviour	Behavioural intention; Attitude toward the behaviour; perceived behaviour control	Subjective norms; perceptions of beliefs of others and motivation to comply	Attitude change communications
Transtheoretical Model	Stages of change; Processes of change; Decision balance; Self-efficacy		Staged-matched cognitive-behavioural modification
Pender's Health Promotion Model	Health value; health locus of control; self-efficacy; perceived health status; perceived benefits; perceived barriers	Cues to action; demographic characteristics; interpersonal influences; situational factors; behavioural factors	Participation in health-promoting behaviour

(Adapted from: Sallis & Owen, 1999)

The Health Promotion Model emphasises cognitive influences on behaviour. The primary mechanisms are cognitive-perceptual factors, which are said to influence the likelihood of a health-promoting behaviour being performed (Figure 3). Foremost among these factors are “importance of health” and the “perceived control of health”, (i.e., health value and health locus of control; Fotheringham & Sawyer, 1995). This model incorporates these factors as direct influences on health behaviour. Another factor considered in this model is the definition of health held by the individual, which has been found to be an important determinant of health-related behaviour in a number of investigations (Bishop & Converse, 1986; Lau & Hartman, 1983; Skelton & Croyle, 1991).

Figure 3: Pender’s Health Promotion Model (Source: Fotheringham & Owen, 1999)



The Health Promotion Model suggests that the effect of cognitive-perceptual factors on health-promoting behaviour is mediated by factors such as “biological characteristics” and “situational variables”. It recognises the impact of interpersonal influences, including the expectations of others, the health-related behaviour of family members, and relationships with health professionals. The final component of the Health Promotion Model is “Cues to Action,” which may be either intrinsic or extrinsic. Pender (1987) suggests as an example that “feeling good” as a result of exercise may act as an intrinsic cue for continuing exercise, while health promotion programs may act as extrinsic cues for initiatives to be more active. The foundations of this model within the constructs of the Health Belief Model, and the improvements made on that model, make the Health Promotion Model potentially valuable in the development of theory-driven health promotion strategies for physical activity

2.2.1.3 THE THEORY OF REASONED ACTION

Fishbein and Ajzen’s Theory of Reasoned Action (TRA) is a theory of behaviour developed from the traditions of cognitive and social psychology (Fishbein, 1972, 1980; Fishbein & Ajzen, 1975). According to the TRA, the performance of voluntary health behaviours can be predicted from the intention to perform that behaviour (Egger, Spark & Lawson, 1991). Intention to perform a health behaviour is a function of attitudes to that behaviour and of the relevant social norms. Attitudes to the health behaviour (e.g., physical activity) are formed from beliefs in the consequence of that behaviour (e.g., health benefits of physical activity), weighed by the value of that consequence (e.g., value of long term health). Social norms are conceived as the expectations of significant others (such as family members and peers), modified by a desire by the individual to comply with those expectations. Studies have found the TRA to be predictive of a range of health behaviours including preventive health behaviours (Bandura, 1997a; Miller, Wikoff & Hiatt, 1992; Terry, Gallois & McCamish, 1993), physical activity (Valois, Desharnais & Godin, 1988), weight control (Saltzer, 1978), medication use (Ried & Christensen, 1988) and use of health-care facilities (Hendricks, Freeman & Sheilham, 1990).

A recent evolution of the TRA, that has not been so extensively tested is the Theory of Planned Behaviour (TPB). The TPB is an extension of the TRA, with the addition of the concept of perceived behavioural control (Ajzen, 1991; Montaño, Kasprzyk & Taplin, 1996), a construct similar to Bandura’s self-efficacy (Bandura, 1997a, 1997b). In the TPB, perceived behavioural control is defined in terms of control beliefs (concerning the absence or presence of supports or barriers to the performance of an activity) and perceived power (the facilitating or inhibiting impact of each of these supports and barriers). Although the TPB, and this operationalization of perceived behavioural control, have not received extensive testing to date, there is some evidence to suggest that this theory could be potentially useful for predicting health behaviours (Montaño, et al. 1996).

2.2.1.4 THE TRANSTHEORETICAL MODEL

Stage-based theories and models of behavioural change have generated considerable interest among health behaviour researchers since the early 1980s (Rippetoe & Rogers, 1987). Such frameworks have also had considerable appeal to practitioners and policy makers (Glanz et al., 1996). While a number of stage-based frameworks have been applied to health behaviours (Weinstein, Rothman & Sutton, 1998; Brownell, Marlatt & Lichtenstein, 1986), it is arguable that the most influential of these has been the Transtheoretical Model which proposes a set of behavioural stages (DiClemente, Prochaska & Fairhurst, 1991; Prochaska & DiClemente, 1983). It focuses on both current behaviour and future behavioural intentions, and provides a framework that classifies motivational readiness for behaviour change (Abrams, 1993; Marcus, Eaton, Rossi et al., 1994). Thus, behaviour change is not seen as an all-or-nothing phenomenon, or a state of action versus inaction, rather, behaviour change is seen as a series of stages and procedures (Abrams, 1993).

The five stages (DiClemente, et al. 1991) which form the core of the Transtheoretical Model are:

- Pre-contemplation, in which health behaviour change is not being considered
- Contemplation, in which health behaviour change is considered
- Preparation, in which an individual takes small steps towards health behaviour change
- Action, involving the initial modification of the habit
- Maintenance, when the change is sustained over six months or more.

While discrete, identifiable stages of change, reflecting varying degrees of readiness to modify behaviour, have been proposed by others (Weinstein, et al. 1998; Brownell et al., 1986). A major feature of the Transtheoretical Model is its recognition of the importance of a broad set of stages, including the early stages of change (Rossi, Rossi, Velicer et al., 1995). In the Transtheoretical Model, change is viewed as a continuum, with individuals leaving and re-entering at different points. Relapse is a key element of any stage-based model of behavioural change (Brownell et al., 1986; Marlatt & Gordon, 1985). In relapse, individuals may lose resolve and abandon new behaviour patterns, feel guilty, lose confidence and revert to their previous habits, with probable recycling through the earlier stages of Precontemplation or Contemplation.

The Transtheoretical Model has been applied to examine a range of health behaviours as diverse as physical activity, smoking cessation, quitting cocaine use, safe sex, sun screen use, mammography screening, and delinquent behaviour (Donovan & Owen, 1994; Owen & Crawford, 1998; Prochaska & Velicer, 1994). As well as identifying those who are ready to modify behaviour, a key feature of the Transtheoretical Model is its emphasis on examining transitions between the various stages, by integrating components of other theories (Fotheringham & Owen, 1999). Physical activity studies that have employed Transtheoretical Model will be reviewed in Chapters 3 and 4.

2.2.2 COUNSELLING AND SCREENING

A range of health promotion approaches in which the focus is on the delivery of relevant information has the potential to promote physical activity participation in individuals. Health professional counselling, telephone counselling, and automated telephone-delivered advice are examples of these approaches.

Individual counselling approaches, utilising credible counselling sources such as General Practitioners and other health professionals represent a potentially effective method of promoting physical activity at the individual level. General Practitioners, in particular, hold a trusted position in society and are in contact with a very large proportion of the population; a recent study identified that 83% of the Australian adult population see a GP each year (Bridges-Webb, Britt, Miles et al., 1993). General Practitioner counselling could include verbal advice as well as the provision of written materials, activity calendars, informational videos or other materials that promote regular participation in physical activity. A major barrier to this approach, however, is the heavy time demands it places on GPs (Bull, Schipper, Jamrozik & Blanksby, 1997).

Telephone-based counselling approaches can also be used as a minimal intervention approach and these can be used as a follow-up to GP counselling or as a stand-alone approach. Several studies have tested this approach as a follow-up to health education following cardiac rehabilitation (Gortner & Jenkins, 1990; van Elderen van Kemenade, Maes & van den Broek, 1994), bypass surgery (Beckie, 1989) and myocardial infarction (Gardin, Kerr & Bay, 1988). The utility of this approach for physical activity promotion has received little attention to date.

A similar approach to telephone counselling is the use of automated telephone-delivered health advice, sometimes referred to as Telephone Linked Care (Friedman, 1998). Telephone Linked Care uses recorded messages, accessed by recipients through use of a telephone keypad. The advantage of this approach is its low cost for delivery; the major disadvantage is its lack of personal contact - a factor which can make these systems less appealing, particularly to older adults. Again, the use of this approach for physical activity promotion has received little attention to date.

Another means of delivering promotional material is through screening programs. Screening programs have been used extensively for the detection of diabetes, assessment of serum cholesterol levels and other cardiovascular disease risk factors (e.g. Gran, 1995; Strychar, Potvin, Pineault, Pineau & Prevost, 1994). These programs may be workplace-based or use mobile screening units, (e.g. which travel to major shopping centres). There is potential to use screening programs to assess physical activity participation and promote increased participation, in diverse population groups.

2.2.3 PRINT- AND WEB-BASED APPROACHES

Arguments have been put forward about the potential uses of the new Information Technology (IT) to provide a variety of exercise adherence interventions to supplement, or possibly to replace, existing face-to-face counselling and social support mechanisms (Dirkin, 1994; Fotheringham, Wonnacott, Owen, in press). The potential of the Internet and email technologies to influence physical activity and other health-related behaviours are considerable, though largely untested. The capacities of these new IT systems are extensive, allowing quick, direct communication with and between individuals, both within and outside organisations. Internet systems and email are available to an increasing proportion of the population (over 48% of Australian households now have personal computers with Internet connections). Recent US data indicates that 30% of Internet users access the Internet to seek out health information (Napolitano et al., 2000). As such, Internet-based interventions appear to have good potential to positively influence physical activity participation. The potential advantages of website-based delivery of a self-help physical activity program include rapid, convenient access at networked workplaces, cost-effective ways to reach large numbers, immediate feedback to participants through the interactive nature of this medium, and the capacity for specific tailoring of advice. Further, one recent study indicates that young adults prefer to obtain information through this medium than through more traditional print or broadcast media (Fotheringham, Wonnacott & Owen, in press).

Available evidence from international studies allows some judgments to be made about the efficacy of print-based physical activity programs. Interventions based on the Transtheoretical Model utilise the matching of program attributes to the individual's stage of change and have been shown to be more effective than no treatment or interventions that are not stage-matched (Dunn, Marcus, Kampert et al., 1997; Marcus, Goldstein et al., 1997; Prochaska & Marcus, 1994; Sallis, Bauman, Pratt, 1998). This will be further discussed in Chapters 3 and 4.

2.3 SETTINGS-BASED APPROACHES

Another common approach to the promotion of healthy behaviour is to deliver the promotional strategy within a particular setting. An early concept of a setting was that of a geographical area or institution containing a large captive audience whereby health messages could be efficiently delivered (Sallis & Owen, 1999). The development of a settings approach to health promotion is now firmly established in conceptual frameworks that set out the determinants of health, strategies for improving health, and specific goals and targets for guiding health promotion efforts (Glanz, 1990). As such, this has led to more strategic thinking about settings for health promotion, and accordingly, the scope and methods of health promotion have dramatically diversified during the last few decades. To date, there are a number of settings that have been found to be relevant to health promotion. These include: communities, workplaces, schools, healthcare settings and the consumer market place (Glanz et al., 1990).

Behaviour settings are the social and physical situations in which behaviours take place, by promoting and sometimes demanding certain actions and by discouraging or prohibiting others (Owen, Leslie, Salmon, Fotheringham, in press). It is obvious that some settings specifically promote physical activity (for example sports fields, gymnasiums, bicycle trails). Others discourage, restrict, or prohibit activity (for example, computer workstations, highways and domestic living areas). A description of community, workplace, school and tertiary settings with potential for increasing physical activity is provided below.

2.3.1 COMMUNITY SETTINGS

The term 'community' refers to local groups of people, whole cities, or even whole nations planning ways to enhance their health. The Ottawa Charter for Health Promotion (1986) emphasises that health for all requires strengthening community action to enable people to take greater control over the determinants of their health. The growing epidemic of cardiovascular disease has facilitated large-scale evaluations of community based approaches; these have highlighted population-wide education and have also included changes in community organisations, environmental changes and incentives as examples (Bracht, 1990). Despite this, community wide interventions have not yet been demonstrated to be highly effective. According to Sallis & Owen (1999 p.163), "we need to learn much more about how to effectively increase physical activity in entire populations. It is likely more intensive and longer-term approaches are required."

There are numerous opportunities for health promotion within community settings including primary health care settings, GPs, schools, workplaces, recreation centres and neighbourhood groups. However traditionally, research in this area has focussed on a clinical approach for defining and measuring exercise behaviour. That is, research and program efforts have focused on those individuals who seek formal exercise programs at a particular setting and time, and in a format designated by a health professional (Dishman, 1994). These efforts generally attract individuals who are already reasonably motivated, or have a history in participating in formal exercise, as opposed to the more typical sedentary individual in the community. An alternative to the clinical model of health promotion is the public health approach. This is where health professionals seek out sedentary individuals in the population, rather than waiting for those individuals to present themselves (Dishman, 1994). There are many examples of community-based promotional strategies used for physical activity and these will be reviewed in Chapters 3 and 4.

2.3.2 WORKPLACE SETTINGS

A common setting for the promotion of physical activity is the workplace. The majority of the Australian adult population spend up to 8 hours per day at work (ABS, 1995b). In the workplace, a large proportion of adults are grouped in the one location, providing a conducive environment

for the development of peer-support networks. Hence, the workplace represents a convenient and potentially influential environment to foster and encourage physical activity (Shepard, 1996).

Over the last decade, findings have demonstrated the favourable health and cost-benefit of programs conducted in the workplace outcomes (Pelletier, 1996). Workplaces are becoming accepted as an important channel for health promotion and evidence is emerging in favour of workplace programs as a means to reduce cardiovascular health problems and improve employee well-being and morale (Shepard, 1996). In the United States, studies have shown that improving the health of the workforce leads to a reduction of sick leave, accidents at work, and employer health insurance costs (Pelletier, 1996). These have proven to be powerful and effective incentives to large-scale employers, and many employers now conduct health promotion programs to actively promote the health of their workers. These include environmental measures such as designated non-smoking areas, healthy diet alternatives, and safe and secure areas to store bicycles (Bennett & Murphy, 1997). More active programs have involved health screening programs and incentive schemes to facilitate behaviour change.

Evaluation of workplace smoking bans at the time of their introduction in the early 1990s indicated that these initiatives reduced overall cigarette consumption (Borland & Owen, 1995). More recent workplace physical activity promotion studies using incentives and competition, and including both employees and management in the planning of programs, indicate that these factors can increase participation (Gomel et al., 1993). Workplace physical activity programs often recruit up to 20-30% of the work force, and these are mainly white-collar workers, who are better educated, more fit and more aware of health issues than non-participants (Lovato & Green, 1990). Three main priorities of research have been recommended for successful health promotion strategies in workplace settings (Glasgow & Telborg, 1988; King et al., 1995). First, there is a need for controlled studies that permit systematic evaluation of programs. Second, more studies should be directed at moderate-size workplaces and those that employ a diversity of socio-economic and ethnic groups and third, the interventions should be more comprehensive and offer more than education programs.

2.3.3 SCHOOL AND UNIVERSITY SETTINGS

Health education includes classroom teaching, teacher training, and changes in the school environment that foster and support healthy behaviours. Evidence suggests that school health programs which are integrated and comprehensive and involve curriculum, the environment and the community, are more likely to lead to advancements in the health of young school children and adolescents (National Strategy for Health Promoting School, 1997). Health Promoting Schools are inclusive, and involve the entire school community, students, teachers, parents, and the broader community to become fully engaged in improving the outcomes of health promotion activities. A Health Promoting School approach recognizes the different components of the curriculum. Environment and partnerships are also important, however, the links between relevant health areas are more critically emphasised (National Strategy for Health Promoting

School, 1997). In the past, school-based health promotion studies have addressed physical activity, as well as smoking prevention, diet change and reduction of body fat (Resincow & Robinson, 1997).

There are indications from research investigating a variety of health behaviours (e.g. smoking, alcohol consumption), that behaviour patterns established in young adulthood are maintained through adult life (Raitakari et al., 1994). Once young people leave school, however, more flexible approaches to the promotion of physical activity may be required. Some young people leave school and enter the workforce, and are therefore approachable through the workplace. An increasingly large segment of the young adult population however, enter tertiary education; in 1995, 39% of 15-24 year-olds in Australia were enrolled in tertiary education (ABS, 1997). This makes tertiary education campuses an important and potentially influential setting for many young adults' health behaviour, including their physical activity. Australia's National Health Priority Areas for cardiovascular disease specifically identify tertiary education campuses as priority settings for the development of strategies to increase the proportion of students participating in physical activity (Australian Institute of Health & Welfare, 1997). Campus based programs, particularly if they are integrated with local community approaches and attractive on-campus facilities, have the potential to provide an excellent setting to promote lifestyle physical activity amongst young adults.

Many of the population-based approaches to health promotion can also be applied within a settings-based context. Indeed, the environment and policy considerations important in population approaches may be more easily defined and understood within particular behaviour settings. For example, smoke-free policies have been applied within many workplace and educational settings.

2.4 CONCLUSIONS

This chapter provides an overview of the different health promotion approaches that can be applied to physical activity. Some of these approaches have already been applied to the promotion of physical activity and Australian experiences will be reviewed in the following chapter. International physical activity promotional approaches will be reviewed in Chapter 4. Some of the approaches described in this chapter are yet to be applied to physical activity and need to be considered as health promotion strategies with potential to change physical activity behaviour at the population and individual levels. These will also be identified in Chapters 3 and 4.

CHAPTER THREE: A SUMMARY OF AUSTRALIAN PHYSICAL ACTIVITY INTERVENTIONS AND PROMOTION INITIATIVES

OVERVIEW

This chapter reviews Australian physical activity promotion initiatives and interventions. The structure of this chapter will follow a settings format, as presented in Chapter 2. It is important to note, however, that to date, not all approaches described in Chapter 2 have been used to promote physical activity in Australia and only those approaches that have been adopted will be described in this chapter.

3.1 POPULATION APPROACHES

It is unlikely that the national goal of reducing the proportion of the adult population that is sedentary will be adequately addressed by strategies targeted at individuals or small groups of individuals. Physical inactivity is a population-wide problem in Australia and therefore strategies must be developed to affect entire populations (Sallis & Owen, 1999). The major objectives of current population-based physical activity promotional efforts in Australia are to assist inactive individuals to adopt and maintain moderate-intensity activity on a regular basis. This section describes the main components of population-based approaches that have been applied in Australia, including environmental and policy interventions that increase accessibility and participation in physical activity, and mass media programs.

3.1.2 POLICY APPROACHES

Organizational policies relating to physical activity are pursued at a variety of different levels, including organizations, local communities, state, regional and national levels (King, 1999). Over the last decade in Australia, there have been numerous policy statements and initiatives designed for the promotion of physical activity in whole populations. Table 3.1 provides a summary of these policies.

Nutbeam and colleagues (1993) reported on *Goals and Targets for Australia's Health in the Year 2000 and beyond*. The purpose of these targets was to increase the proportion of Australians who engage in regular physical activity. The national goals and targets were:

- Men and women 20-69 years: to increase the percentage who reported any walking for exercise in the last 2 weeks to 75%, and reduce the percentage who did no physical activity to 15%.
- Adults 30-69 years from low SES backgrounds and adults 70+ years: to increase the proportion who participated in any physical activity (incidental and functional).
- Youth 19-24 years: to increase the proportion who maintain childhood physical activity throughout adolescence and adulthood.

- Children 5-18 years: to increase the proportion who participate in any physical activity to at least 3 times per week (Nutbeam et al., 1993).

Table 3.1: Summary of Policy Statements and Recommendations for Physical Activity in Australia

Agency	Document	Year
Commonwealth Department of Health and Human Services	Goals & Targets for Australia's Health in the year 2000 and beyond	1993
Commonwealth Department of Health and Human Services	National Goals, Targets and Strategies for Better Health Outcomes into the next century	1994
Australian Sports Commission	National physical activity participation framework	1997
Public Health Association of Australia	Recommendations for increasing physical activity in the population	1998
National Heart Foundation	Policy statement and recommendations for physical activity	1999
The Strategic Inter-Governmental Forum on Physical Activity and Health (SIGFPAH)	Active Australia	1999
VicHealth	Strategic Directions 1999-2002: Promoting a State of Health	1999
Sports Medicine Australia	National Public Health Committee Philosophy Document	1999
Department of Human Services	Active for Life	1999

In 1994, the Commonwealth Department of Health and Human Services released its *National Goals, Targets and Strategies for Better Health Outcomes into the next century*. The goal was to 'increase participation in regular physical activity,' by adopting a range of strategies. These recommended strategies included a variety of different approaches and settings, highlighting the importance of government and non-government organisations (e.g. National Heart Foundation)

and their involvement in the promotion of physical activity. In addition, strategies directed towards school physical education programs and tertiary settings were provided.

The National Heart Foundation of Australia (NHF) have issued a policy statement and recommendations relating to physical activity, and have developed a range of strategies designed to increase general levels of physical activity in the population. Examples of strategies include: addressing urban planning, transport and environmental policy development and implementation; supportive environments for physical activity that are safe, clean, accessible and secure; and provision of social support and physical activity opportunities that consider issues for people with special needs (e.g. people with different cultures, age, or with disabilities). For further information on physical activity policies and recommendations, refer to the NHF website at: <http://www.heartfoundation.com.au>.

In 1998, the Public Health Association of Australia (PHA) also recognised the importance of physical activity in the population. The PHA reports on a number of recommendations conducive for increasing physical activity, highlighting the importance of government support and co-operation, particularly in terms of continuing school-based programs, and safe urban and rural environments that encourage being active as a part of daily life. Further, support and encouragement for workplace programs is also reported. For additional information regarding the PHA policy and recommendations, refer to their website at: <http://www.phaa.net.au>.

Other recently established co-ordinating bodies and initiatives include The Strategic Inter-Governmental Forum on Physical Activity and Health (SIGFPAH). This forum is the national body that provides the means for co-ordinating the work of the Commonwealth, State and Territory health and sport authorities undertaken broadly under the umbrella of Active Australia (the national participation framework for moderate-intensity physical activity). The inaugural meeting of SIGFPAH was recently conducted in May 1999. The national guidelines for physical activity for Australians (launched in May 1999), represents the implementation of one of the first recommendations of Acting on Australia's weight. The SIGFPAH has identified the transport sector as a key sector for collaboration and a variety of initiatives in this area are currently under development, in accordance with Acting on Australia's weight recommendations (Australasian Society for the Study of Obesity [ASSO], 1999). More information is available on the ASSO website at <http://www.med.monash.edu.au/medicine/mmc/asso>

VicHealth is another governing body that is committed to health promotion in accordance with national and state population health priorities (VicHealth, 1999). Key initiatives related to physical activity to be developed and implemented over the next three years (1999-2002) include:

- The directing of investments towards particular health promotion action areas of physical activity.
- The development of VicHealth integrated action plans for physical activity.
- Modification and extension of settings for health promotion in sport, recreation, education, community, health, and the workplace, as examples.

- The conduct of feasibility studies for developing health promotion initiatives in the transport, urban planning and environment sectors.

Further information may be found at the VicHealth website at: <http://www.vichealth.vic.gov.au>

Sports Medicine Australia (SMA), the peak sports medicine and sports science body, has also recently issued a policy statement/recommendations for physical activity called the National Public Health Committee Philosophy Document. The SMA National Public Health Committee recommends the implementation and delivery of the following national public health policies, strategies, goals and frameworks:

- Active Australia: A National Participation Framework (inactivity, CVD prevention, links of health with the sport and recreation of other sectors)
- National Health & Medical Research Council (NHMRC) Acting on Australia's Weight: A Strategic Plan for the Prevention of Overweight and Obesity
- Active for Life: Promoting Physical Activity in Victoria
- SportSafe Australia: A National Sports Safety Framework (sports injuries).

Sports Medicine Australia plans to develop and provide guidelines that promote safe, regular and life-long participation in regular physical activity. In considering the promotion of physical activity, the following concepts and principles will be considered by SMA:

- Physical activity is achievable by all
- Link and highlight current physical activity strategies
- Clear identification of target groups
- Sports Medicine Australia's role for its members (i.e. sport medicine, sport science and exercise professionals) and within the community
- Link and support complementary health strategies

There is a need to develop and promote guidelines for safe and life-long participation in regular physical activity. These guidelines will be useful for guiding public health policy, benefiting individuals, and health/fitness professionals in their choices of safe activity (SMA, 1999). For more information, please refer to the SMA website at: <http://www.sma.org.au>.

The Victorian State Government Department of Human Services (DHS) funds or directly delivers a diverse range of services, including a range of initiatives relating to physical activity. The Department's key Victorian physical activity initiative is '*Active for Life*'. Within the '*Active for Life*' initiative, there are currently five programs that are taking place. *Active Script* is a GP intervention program; *Allied Health*, is a program targeting physical activity knowledge and attitudes; *Walk and Talk* is a community-based program to increase walking in older adults and

those in public housing; *Active with Arthritis* is a home- and centre-based activity program for people with arthritis; and *Physical Activity & Nutrition in Organised Care Settings* is a nutrition and physical activity program currently targeting those in juvenile justice centres, those with intellectual disabilities, and those in residential aged care. Other agencies also taking part in the Active for Life initiative include Sport and Recreation Victoria, VicHealth, the Department of Education, the Victorian branch of the National Heart Foundation, Arthritis Victoria, Parks Victoria, and Vicfit.

The primary goal of the 'Active for Life' initiative is to increase the proportion of adults aged 18 - 75 achieving 5 sessions and accumulated 150 minutes of physical activity per week. There are a number of objectives that will also be evaluated as secondary outcomes.

1. To “develop and strengthen partnerships and alliances between organisations and sectors to create supportive policies and programs for physical activity participation in the community”.
2. To “increase public and professional awareness of the benefits of regular physical activity and commitment to increasing participation, especially in groups facing particular barriers”.
3. To “improve access to a wide range of physical activity programs and services, including encouragement and support services, that are well organised, culturally appropriate and inclusive”.
4. To “enhance provision of safe, well designed and attractive places in which people can participate in both structured and unstructured forms of physical activity” (Department Human Services, Active for Life Goals and Strategies, 1999:Draft Document).

3.1.3 ENVIRONMENTAL STRATEGIES

Unfortunately, there is little evidence in Australia for the effectiveness (or otherwise) of environmental and policy interventions designed to increase physical activity levels at a community-wide level. Nonetheless, there is growing recognition that modifying the physical environment is an important consideration, as it provides cues and opportunities for physical activity (Egger et al., 1999). The impact of the environment on energy expenditure during physical activity is influenced by the design of the urban environment, domestic appliances and buildings that favour or discourage incidental physical activity (King et al., 1995; Sallis & Owen, 1996). However, the physical environment can also be influential in providing recreational opportunities for structured physical activity that is accessible, safe and convenient (King et al., 1995; Sallis & Owen, 1996). According to Bauman and colleagues (1996), the case for environmental change strategies and policy interventions is currently based on expert opinion, as well as evidence of success in the area of tobacco control. Internationally, there are recommendations to implement changes at political and environmental levels, in order to promote increased participation in physical activity (Blair et al., 1996). Examples of such interventions include establishing car-parking places further away from the buildings, network

cycling, walking paths and bicycle tracks (King et al., 1995). These and other international interventions are further discussed in Chapter 4.

A search of recent Australian literature found few studies of environmental interventions designed to increase physical activity levels among sedentary Australians. The majority of Australian studies that evaluate environmental interventions and strategies to increase physical activity are mainly qualitative and largely based on formative stages of development in this area.

A qualitative study of environmental factors influencing active lifestyles in two country towns in New South Wales, consisted of five focus groups each of 6-10 participants from community support groups, Tertiary and Further Education students, and workplace groups (Hahn & Craythorn, 1994). The findings from the focus groups suggested that too much recreational land is assigned for structured sport and not enough is allocated for unstructured recreational physical activity such as walking and cycling. Attractiveness, accessibility and safety were all identified as potential influences of the physical environment on physical activity participation.

Corti and colleagues (1996) reported a qualitative study that examined the awareness and use of free and pay physical activity facilities and factors that influence their use. Four focus groups (n=6-8 participants per group) stratified by socio-economic status and exercise behaviour, were held in Perth, Western Australia (Corti et al., 1996). Findings from this study revealed that group participants were aware of facilities in their vicinity and that use of these facilities changed according to preferences, changing social circumstances, necessity, perceived ability and age barriers, and competing commitments. Accessibility and proximity were important and inter-related with other factors. Further, making use of parks was influenced by their size, presence of amenities and aesthetic features, and many participants reported enjoying walking in their local neighbourhood. Enjoyment of walking was affected by urban design features including walking paths, local shops, availability of footpaths and traffic control measures (Corti et al., 1996). Factors such as fear of dogs and personal safety were reported as deterrents to physical activity by participants in the community. Hence, findings from this study suggest that the use of recreational facilities for physical activity stems from complex interactions of personal and environmental factors. Even though proximity and accessibility are important considerations for being physically active, neither provides a sole explanation for patterns of use (Corti et al., 1996). Extending from this study, Corti and colleagues (1997) reviewed spatial access to recreational physical activity facilities and found that access to these were associated with participation in health programs and further, access to a supportive environment produced small, yet measurable improvements in increased participation in vigorous exercise and fitness levels.

The National Heart Foundation and the Commonwealth Department of Health and Family Services funded a project examining how the urban environment supports individuals in engaging in physical activity (*'Supportive Environments for Physical Activity,'*) (Wright et al., 1996). Despite this work being important, it provides only descriptive information about relevant issues and opportunities for intervention. This study examined people's experience of living, working and using the facilities in and around Marion (a local government area in Adelaide, South Australia) in their daily activities. This qualitative research used focus groups and interviews, and involved people from work, shopping areas, caregivers, and leisure and

recreation occupations. A total of 83 people participated in focus groups, and 21 people in unstructured group discussions. These findings indicated that there were several major issues that influenced participation in regular physical activity and these were particularly relevant to walking and cycling. All of these issues were central to council business and urban design (Corti, Egger et al., 1999). Environmental factors that may be important determinants of regular physical activity include:

- A shared road system that could be used by all people (pedestrians, cyclists, etc), as opposed to being primarily designed for motorists;
- The need for a specific destination or purpose to walk or cycle (for example, parks, shops); and
- The need to feel safe and accepted as a part of the community.

A cross-sectional study of the relationship between physical activity and community facilities used 1765 Adelaide residents from three local government areas (MacDougall, Cooke, Owen, Willson & Bauman, 1997). Respondents were asked to report their level of satisfaction with sport, recreation facilities, parks, and meeting places in their local community. It was found that those who were dissatisfied with the recreation facilities in their community were 60% more likely to be participating in low levels of physical activity compared to those who were satisfied with these recreation facilities. A limitation of the study, due to the cross-sectional design, was the inability to determine causation between the factors rather than simply establishing association. It may be that for the inactive people in this study, dissatisfaction with sport and recreation facilities may have lead to their inactivity. Alternatively, being inactive could have resulted in a different perception of recreation facilities in their community compared to those who are more active.

More recently, another cross-sectional study was conducted in South Australia to examine how hospitals in Adelaide have embraced the concept of cycling and walking for transport as a means of increasing participation in health promoting exercise (Owen, Scullion & Day, 2000). This study found that the majority of hospitals surveyed claimed they are not significantly involved in health promoting activities, despite the common belief that hospitals do have a role in encouraging health promotion. In terms of transportation, insufficient attention was directed towards transport modes other than motor vehicles, and access by cycling or walking were accorded low priority (Owen, Scullion & Day, 2000). Where bicycle parking facilities were made available, in most instances, these were inadequate. Findings from this study concluded that hospitals in Adelaide are not adequately aware of the link between exercise and transport. They have not significantly re-orientated their efforts towards health promotion in relation to physical activity and have not seen the opportunity in this area to assume a leadership role in health promotion. Few hospitals have translated this into corporate policy and therefore, into strategies and tangible outcomes (Owen, Scullion & Day, 2000).

In order to achieve major environmental changes, long-term planning is required. Government coalitions and intersectoral support are needed to address these issues and to develop long-term strategies aimed at improving community infrastructure to increase physical activity levels. Attention to achieving other community outcomes, including reductions of atmospheric pollution and improvements in traffic control, are also warranted (Trewin, 1997). According to Egger and colleagues (1999), environmental interventions hold great potential for long-term change and implementation of the National Physical Activity Guidelines. As this approach to increase physical activity is relatively new in Australia, there is limited supportive evidence for its use and absence of recognised methodology of implementation and evaluation.

3.1.3 MASS MEDIA

As described in Chapter 2, media-based physical activity interventions include a variety of graphic, print, audiovisual and broadcast media programs intended to influence behaviour change (Marcus et al., 1998). In Australia, few studies have evaluated the effectiveness of mass media strategies for physical activity.

One of the first mass media programs designed to promote physical activity in Australia was the *'Life Be In It'* national campaign, which began in 1975 and was implemented until the early eighties. One of its main objectives was to encourage people to do a little more exercise each day. It was hoped that when people enjoyed participation in an activity, they would maintain that activity over time, and would increase the duration and intensity of their participation while retaining the essential motivating element of enjoyment (Roberts, 1982). Initial research before the program was implemented, indicated that approximately 20% of the population were regularly active and that the majority of the population harbored no negative attitudes towards activity. These individuals were then identified as the most likely target group for lifestyle modification and intervention, and a program (featuring the cartoon character 'Norm' as a typically sedentary Australian male) was launched two years later to increase community activity levels. However, this campaign was not properly evaluated to identify any significant behaviour change in relation to physical activity. Furthermore, there was no demonstration of awareness levels into positive behavioural actions, as a result of the campaign.

In more recent times, two national physical activity campaigns were conducted by the National Heart Foundation (NHF), and provided an opportunity to examine the impact of serial mass media campaigns aimed at increasing levels of physical activity amongst the inactive. In 1990, the first campaign was known as *'Exercise: Make it Part of Your Day'* (Booth et al., 1992). In 1991, a second campaign was conducted, building on the previous campaign, using the slogan *'Exercise: Take Another Step'* (Owen et al., 1995). These campaigns both emphasised walking as the main activity, and were based on Social Learning Theory and social marketing approaches (Sallis & Owen, 1999). For those individuals who were classified as Precontemplators (ie, those who were not physically active and who were not considering adopting physical activity as part of their lifestyle), the aim was to enhance intentions to adopt

physical activity, drawing on the Transtheoretical Model approach to stages of behaviour change (Prochaska & Marcus, 1994).

Both of these campaigns were promoted by means of paid television advertisements, radio announcements, distribution of a newspaper, leaflets, stickers, posters and T-shirts, publicity tours by two heart health experts, magazine articles and physical activity themes scripted into episodes of two nationally broadcast television series (Sallis & Owen, 1999). Events were promoted through electronic and print news coverage, feature articles and editorials. Other local initiatives by the NHF were conducted in addition to the national media-based strategies. Face-to-face home based interviews were conducted using a representative national sample two weeks before, and three to four weeks after each campaign.

The campaign goals examined were to: (1) increase recall of the campaign message; (2) increase the proportion of the population engaged in regular moderate-intensity activity attributable to the campaign and (3) to influence intentions to be more active (Owen et al., 1995). In response to the first campaign, the prevalence of physical inactivity in the community fell (by less than one per cent) while the proportion who reported participation in walking increased from 70 to 74%. Campaign effects of walking were most noted amongst those aged 40 years and above (Booth et al., 1992). The awareness of the campaign message increased significantly (46% to 71%) and awareness of this message remained quite high (63%) until the 1991 campaign. The changes in reported walking for exercise and in readiness to exercise found in 1990 were not replicated after the 1991 campaign (Owen et al., 1995). In 1990, the prevalence of reporting no intention to engage in more exercise demonstrated the greatest pre-to-post campaign decreases, suggesting that the campaign was most effective in reaching those who were least active and resistant to change (pre-contemplators). The latter campaign message may have just reinforced those current behaviours in those who had already adopted and engaged in physical activity. This was not accompanied by a significant increase in physical activity participation rates, nor a decrease in the proportion of the population who were sedentary (Owen et al., 1995).

The impact of mass media campaigns on physical activity in Australia to date has been modest. However, studies of the impact of Australian national mass-media campaigns provide insight into some of the few data available on the effects of media-based physical activity campaigns in entire populations. Few studies have examined the effectiveness of mass media or other communication strategies on the promotion of physical activity. Mass media interventions have the potential to play a prominent role in the promotion of physical activity, however, more research is needed to determine how best to achieve population change in physical activity participation.

3.2 INDIVIDUAL APPROACHES

Individual approaches, that is those which target change in the behaviour of individual people, have focused on behavioural, cognitive and biological approaches to influence physical activity participation. Motivational strategies, educational strategies, and programs designed to produce

attitudinal change can be categorised as individual approaches. This section reviews published Australian studies which have evaluated interventions designed to promote physical activity participation in individuals.

3.2.1 PRINT- AND WEB-BASED APPROACHES

A range of print-based intervention strategies have been developed to promote participation in physical activity (Marcus, Owen et al., 1998). Web-based interventions, or those based on other aspects of new Information Technology, are at a far earlier stage of development. Web-based approaches are currently being developed, based in part on the lessons learned from print-based intervention trials. When attempting to design any self-help interventions to increase physical activity behaviors, it is important to take into consideration that the majority of the population is sedentary and unmotivated to exercise. Interventions that target only those who are ready to become more active are not going to reach large segments of the population.

Unlike mass-media programs, most print-based interventions have reported increases in physical activity behaviour, at least in the short term (Sallis & Owen, 1999). Most of these print-based interventions have been based on Social Cognitive Theory or the Transtheoretical Model (Sallis & Owen, 1999).

One of the earliest Australian trials to examine a print-based physical activity intervention approach was reported by Owen and colleagues (1987). Results of this indicated that a single mailing of print materials led to greater change in physical activity and adherence than multiple mailings. This was probably because having all the material at hand at once allowed participants greater flexibility in designing their own program to their own needs. Flexibility also appeared to enhance the effects of a print based intervention targeting women of non-English speaking backgrounds; this study also reported significant increases in physical activity behaviour as a result of a motivationally-tailored intervention (Brown & Lee, 1994). A recent print-based randomised controlled trial in a primary-care setting used general practitioners to give written versus verbal physical activity advice to more than 450 sedentary patients (Swinburn, Walter, Arroll, Tilyard & Russell, 1998). Six weeks after the baseline advice was given, it was found that physical activity participation for those who received the written advice increased significantly more than in those who received just verbal advice.

Print-based strategies have also been included as part of broader campaigns. For example, the National Heart Foundation of Australia's *"Exercise: Make it Part of Your Day"* and *"Exercise: Take Another Step"* campaigns in 1990 and 1991, used pamphlets, stickers and posters, along with mass media strategies such as radio broadcasts and television advertising.

Print-based strategies appear to be effective in modifying exercise behaviour, at least in the short term (Sallis & Owen, 1999). However, the long-term influences of these strategies are largely unexplored. A limiting factor for print-based campaigns is their high cost per unit - costs which may be prohibitive for large scale or repeated campaigns (Marcus, Owen et al., 1998).

The use of the Internet as a communication medium reduces this cost - it is no more expensive for 10,000 individuals to access a health promoting website than for 10 people to do so. Research examining the use of information technology to promote physical activity participation is very limited to date. With the increasing prevalence of Internet access and the growing use of email as a means of communication, effective health promoting strategies using these technologies is likely to become an important area for researchers and health promotion practitioners.

3.3 SETTINGS-BASED APPROACHES

The past decade has seen considerable growth in the development of health-related programs and policies targeting particular settings including workplaces, schools, health care sites and other localities in the community that exist in a 'micro' (local) environment (Mullen et al., 1995). This approach is consistent with social cognitive theory, indicating that a reciprocal relationship exists between the physical and social environment, and in an individuals behaviour and cognitive responses (Bandura, 1977). In addition, settings provide a structure for program delivery, as well as the opportunity to create supportive environments. In Australia, there have been a variety of interventions for the promotion of physical activity that have used a settings approach. Those interventions conducted within the community, schools and workplaces are reviewed in the following section.

3.3.1 COMMUNITY SETTINGS

As described in Chapter 2, the community is an important setting for health promotion initiatives. The term 'community' encompasses a wide range of settings, such as primary health care settings, workplaces, schools, and neighbourhood groups. The following three sections focus on studies that were mainly performed in neighbourhood settings.

1.1.1.1 3.3.1.1 WALKING PROGRAMS

A program to promote walking (*Walk and Talk*) amongst older adults in a Melbourne community local council area successfully recruited 213 walkers (55-65 year-olds) over a 5-month summer period (Jones & Owen, 1998). The program required "activators" to act as group leaders and recruit others to regularly walk with them. The program resulted in high levels of walking and its success was attributed to the social dimension of the program, plus the local community base. A similar program (*Just Walk It*) was implemented in Queensland from mid-1995 to early 1996 (Fisher et al., 1998). Thirty walking groups were established, with an average of six members per group. Once again, the most important aspect of the program was identified as the social component, followed by the opportunity to improve or maintain fitness. More than 370 people joined the program, 80% of whom were women, with the average age of 57 years. However, in

terms of attracting sedentary older adults to the program, the majority of participants were active prior to joining (83%), with only 9% reporting being inactive prior to the program commencing.

The *Walk and Talk* and *Just Walk It* programs have been found to be effective in influencing older adults to participate in regular physical activity. In particular, the programs were designed to be self-sustaining with 'activators' taking responsibility for attracting 'new recruits' to the program. The *Walk and Talk* program has since been disseminated nationally, however the success of this strategy has not been formally evaluated.

1.1.1.2 3.3.1.2 INTERVENTIONS FOR AUSTRALIAN MIGRANT WOMEN

Studies of the descriptive epidemiology of physical activity typically show lower levels of physical activity in adults born in non-English speaking countries but who live in an English-speaking country (USDHHS, 1996). In addition, these studies show that women are most likely to be inactive. In Australia, a number of studies have assessed influences on physical activity in migrant women, and brief physical activity interventions have been implemented. A cross-sectional study found that although migrant women had lower levels of physical activity compared to Australian-born women, they had more positive attitudes towards such activity (Lee & Brown, 1998). The key barrier to physical activity identified by migrant women was not having someone to be active with. Forty-four Polish-Australian women underwent a 12-week heart health program, and their physiological changes were evaluated against a comparison group of 30 Polish-Australian women who did not participate in this program (Brown & Lee, 1994). The intervention (mainly a walking program) resulted in significant changes in exercising heart rate, and resting blood pressure compared to the comparison group. Importantly, at a 12-week follow-up, these changes had been maintained for 33/44 of the remaining women. However, longer-term adherence to physiological outcomes was not reported.

A 24-week intervention of 26 Greek migrant women administered a home-based self-help exercise program (mainly walking), and provided an exercise booklet and weekly group meetings during the first 12-weeks (Brown, Lee & Oyomopito, 1996). Compared to the comparison group (22 Greek women), the intervention group had significant increases in fitness and weight loss after 24-weeks. A two-year follow-up of the group found that the program continued to have high adherence, mainly attributable to the program being run within a pre-existing social group and in familiar surroundings (Brown et al., 1998). Interestingly, many of the women modified the walking intervention to a home-based aerobics program of which participants reported a greater enjoyment of preferred activity. A similar program consisted mainly of a home-based self-help walking program, however, this time it was delivered by trained community educators. As in the previous study, there were significant changes in biological indicators such as body fat percentage, and fitness. However, the follow-up only assessed program adherence at the end of 16-weeks, and did not report longer-term follow-up. A further limitation of this intervention study was a lack of control or comparison group. Overall, the important components that contributed to the apparent success of these intervention programs were: the use of existing and convenient local facilities; the transferability of the

program to a home-based application; and the use of social groups to enhance social support for participants.

1.1.1.3 3.3.1.3 STUDIES OF OLDER ADULTS

There has been a small number of studies in Australia that have specifically addressed physical activity in older adults in the community. These have ranged from qualitative, descriptive cross-sectional and prospective studies, to a randomised controlled trial (RCT). Only the RCT's will be reviewed here, the other descriptive studies will be further described in Chapter 6.

In a randomized control trial, a sample of 197 women aged 60 years and older were randomly assigned to either a physical activity intervention group (n=100) or a control group (n=97) (Williams & Lord, 1997). There were no significant differences in physical activity participation between the groups at baseline. The physical activity group participated in an existing community-based program (at no charge) for a total of 42 weeks; the control group had no organised activity. The physical activity program included a combination of walking, muscle strengthening and aerobic exercises involving movement of the legs, trunk and arms. The proportion of those who completed the physical activity program was 72%. For those who adhered to the 42-week program, there were significant improvements in memory span, strength, reaction time, and well-being. A limitation of this study was that the factors that may or may not have contributed to likelihood of adherence to the program were not reported. In addition, longer-term maintenance was not reported. This means that apart from the social support from being part of a group, and the program being an existing one in the community, there is little information about what strategies were used to maintain involvement.

To summarise, strategies to promote physical activity in community settings in Australia have demonstrated short-term success, in both primary (physiological) outcomes and secondary (behavioural) outcomes. The effective components that appear to have contributed to the success of these programs are: providing social support for participants; the use of convenient facilities; the use of existing physical activity programs in the community (e.g. local gymnasium or aerobics classes); and the transferability of the community-based program to a home-based program. Unfortunately, it is not known whether these strategies would be sustainable over time, as only two of the studies reported long-term follow-up (Brown et al., 1998; Jones & Owen, 1998).

3.3.2 WORKPLACE SETTINGS

Another settings-based approach, which has been applied more frequently than other approaches involves workplace-based physical activity promotion initiatives. Recent reviews of general workplace health promotion programs have concluded that despite a number of methodological limitations, research to date indicates favourable health and cost-benefit

outcomes (Shephard, 1996; Pelletier, 1996). Workplaces have been used as an important channel for health promotion, and evidence is emerging in favour of workplace programs as a means to reduce cardiovascular health problems and improve employee well-being and morale (Shephard, 1996). However, it has also been argued that participants in these programs are more likely to be white-collar workers (Dobbins, Simpson, Oldenburg et al., 1998).

In Sydney, an efficacy trial of 4 workplace-based risk factor interventions was performed on 488 participants (Gomel, Oldenburg, Simpson & Owen, 1993). The four interventions consisted of: risk factor education; health risk assessment; behavioural counselling; and counselling plus incentives. Participants in the study (response rate=88%) were selected from ambulance stations around metropolitan Sydney. Physical fitness was assessed using a sub-maximal bicycle ergometer, other health risk factors assessed included body mass index, percent body fat, blood pressure, smoking, and cholesterol. Participants were assessed at baseline, three, six, and twelve months. The study found that interventions that use individual behavioural counselling techniques were the most effective strategies for reducing CVD risk factor behaviours, compared to educational and risk assessment strategies (Gomel et al., 1993).

Designing "fitness" programs in Australian workplaces is likely to be problematic where one of the main outcomes of interest is the physical activity behaviours of individuals. Further insights into the opportunities and barriers in the Australian workplace context are required if relevant and systematic strategies to promote physical activity are to be developed. It seems likely that the "European" style of approach which has used environmental and organisational strategies (as described in the following chapter), may be more useful in the Australian context.

1.1.1.4 3.3.2.1 PROGRAMS FOR LESS-SKILLED WORKERS

King et al (1988) and McCallum (1990) argue that few health promotion programs have properly addressed employees in the less-skilled segment of the workforce. In programs designed to include all company employees, less-skilled workers have been found to be the least likely to begin a program or to participate in either supervised or unsupervised leisure-time physical activity. In addition, they are also less likely to adhere to an exercise program once they have started (Dishman et al., 1985).

The manufacturing industry is one of the largest employers of men in less-skilled occupations in Australia (ABS, 1995b). Analyses of national physical activity participation data have found that, among males, those who are less educated and in lower income occupations are less likely to engage in regular leisure-time physical activity (Owen & Bauman, 1992). Males with a lower level of education, plant and machinery operators or labourers have also been shown to have higher levels of overweight and obesity compared to males with tertiary qualifications or those who are employed in professional occupations (Crawford & Owen, 1994). Further, several studies support the notion that less-skilled workers have higher risk profiles for cardiovascular diseases when compared with professional workers. Less-skilled employees have been found to have higher mean serum cholesterol levels, blood pressures, relative weights and smoking rates

than their professional counterparts (King et al., 1988; Halloran et al., 1993; Niknian et al., 1991).

In 1995, a Commonwealth funded research project (*Healthy Activity for Working Men*) investigated the possibility of increasing physical activity opportunities for less-skilled working males. Initial investigations found four major barriers to implementing physical activity programs (Veitch et al., 1998):

- Lack of time
- Lack of facilities and incentives
- Workers expressed a lack of interest in participating in workplace based physical activity and many believed that they were adequately active during work time
- Management were reluctant to offer programs as a result of increased injury risk and the cost and time associated with implementing programs

Discussions with workers at factory workplaces found that the most desirable options for maximising activity within the workplaces were:

- Provision of time for exercising during a shift
- On-site facilities (such as a gymnasium)
- Set exercise classes at the beginning of each shift
- Incentives or discounts for staff to attend community facilities (Veitch et al., 1998).

As a result of these findings, an attempt was made to trial physical activity programs within factory workplaces. However, these attempts were ultimately unsuccessful. This was an important finding as the implementation of a physical activity program was obviously not an appealing option in the current workplace environment (Veitch, Clavisi, Salmon & Owen, 1998). Subsequently, WorkCover insurers and workplace managers were targeted to determine possible opportunities that could exist within the workplace for workers to be more active (Veitch et al., 1999). In addition, barriers to physical activity were investigated. One of the major findings from the WorkCover insurance companies was their ability to offer partial reimbursement of premiums to pay for facilities and programs that aid in the prevention of injury. These programs could encompass physical activity, however there was a strong perception that further evidence is needed to demonstrate its potential role in injury prevention. The role of injury prevention and the promotion of physical activity is further discussed in Chapter 5.

Workplace managers cited a need for further evidence supporting the benefits of physical activity in the factory environment. Managers were apprehensive about offering physical activity initiatives to their workers, as they are not aware of the potential benefits. In addition, there was no motivation for them to make physical activity a priority (Veitch et al., 1999). To date, there has

been no expectation for factory workplace management to play an active role in public health initiatives and few competitors are offering activity options. In order to make changes it may be necessary to raise the profile of physical activity benefits within the workplace environment.

Examination of workers' activity levels was also investigated. Assessment of two population data sets showed that the occupational physical activity levels of workers in lower-skilled occupations were higher than those reported for those in higher-status occupations (Veitch, Salmon, Clavisi, & Owen, 1999; Salmon, Owen, Bauman, Schmitz & Booth, 2000). Taken together with the data on leisure-time physical activity, it appears that many males in low-skilled, non-trade occupations could meet current health-related physical activity guidelines.

A further study involving interviews and objective assessments of physical activity with accelerometers in a group of 24 male factory workers indicated that all of the workers that participated in this study had occupational physical activity energy expenditures above the standard for health benefit gains (DiConza, 1997). In addition, a high proportion of workers were adequately active during their leisure-time. One of the major findings raised by these results was whether it was realistic to use workplaces as a forum to encourage physical activity in a group of workers who appear to be meeting current physical activity guidelines anyway. However, in this sample of workers it was found that the majority of workers were smokers with BMI levels in the overweight range. Similar health risk behaviours were found after secondary analysis of two population-based data sets (Veitch et al., 1999; Salmon et al., 2000). These results indicate that along with physical activity initiatives, smoking cessation and weight loss programs are also needed to decrease the risk of cardiovascular disease. Further research is needed to assess occupational physical activity in low-skilled workers, particularly in women as the findings from this project can only be generalised to men.

3.3.3 SCHOOL AND UNIVERSITY SETTINGS

In Australia, there is limited evidence of studies and interventions designed to increase participation in physical activity within school and tertiary settings. Moreover, the few Australian interventions that have been conducted have mainly focused on cardiovascular health and physical fitness. One specific intervention involved a physical activity program implemented at a university campus. The majority of programs to promote physical activity have been designed to assess the beliefs, feelings, perceptions and preferences of the individual. A summary of recent Australian studies relevant to physical activity in schools and tertiary campuses is reviewed in this section. Some of these studies are discussed further in Chapter 6.

1.1.1.5 3.3.3.1 SCHOOLS

In most industrialised countries, schools are the primary institution with responsibility for promoting physical activity in young people (Sallis & Owen, 1999). The potential for physical education classes to reach all students makes the school environment instrumental in influencing youth physical activity patterns (Parcel et al., 1987; Simon-Morton et al., 1991).

The *NSW Schools Fitness and Physical Activity Survey* (1997) revealed that the majority of surveyed primary and secondary schools contained some facilities that could be used for sport, physical activity and skill development (Booth et al., 1997). However, few schools reported making use of these facilities outside school hours. It has been suggested that schools could make more effective use of their facilities and increase participation in physical activity, by inviting community-sporting groups to conduct activities after school hours. Other findings of interest from this report were that few primary schools involved teachers with specialist training in sport and physical education and further, many primary schools provided less than 45 minutes of physical education per week. Yet, when viewed in terms of the time made available for sport, the majority of schools reported a minimum of 90 minutes per week for physical education and sport (Booth et al., 1997). There have been numerous goals that have been proposed for physical education in schools, including cognitive, motor, social, emotional and sports-skills development. In order to achieve these goals, it is necessary for children to be active. In response to findings from the *NSW Health and Fitness Survey*, it has been recommended that a minimum of two hours per week be made available for physical education and sport in schools, with equal attention and time allocated for fundamental motor skill and development (Booth et al., 1997).

In 1993, the Minister for Education commissioned a Review of Physical and Sport Education in Victorian schools, known as the *Moneghetti Report*. This review was instrumental in developing strategies to increase students' participation in physical and sport education (Directorate of School Education, 1993). As a result, the Victorian government implemented a policy to place physical and sport education on the timetable of every government school in the state. It recommended that all students from prep to year ten engage in sport and physical education classes on a regular, weekly basis. This policy came into effect in 1994 and set a benchmark for physical and sport education throughout Australia (Directorate of School Education, 1993). Briefly, some examples of key elements of the strategy to improve physical and sport education in schools include:

- High quality training programs developed and implemented in physical education and sports coaching
- Service agreements with tertiary institutions, sporting organisations and other professional bodies to facilitate the delivery and promotion of sport and physical education
- Monitoring of student outcomes, and review of implementation of recommendations (Directorate of School Education, 1993).

For more information of the Moneghetti report, a copy is available on-line at: www.sofweb.vic.edu.au/phised

Research directed at increasing physical activity in primary schools is limited in Australia. However, there are two studies which have focused on cardiovascular risk factor reduction and increased fitness in young school children. In 1992, the '*Kurri Kurri Healthy Heartbeat Project*' was trialed amongst grade three to six students (over two school terms) and involved a daily

heart health lesson plus 30 minutes of physical activity conducted in the school. This program was largely educational in delivery (lessons and exercise were divided into four sections: heart, nutrition, smoking, physical activity), but also involved community and parental involvement and support. Findings from this program revealed a greater increase in knowledge reported by the intervention group (10%) as opposed to the control group (5% respectively). Outcome evaluation findings suggested there were improvements in physical fitness, flexibility, muscle strength and endurance, and this was particularly noted for girls (Williams & Plotnikoff, 1995; Plotnikoff et al., 1996). Key lessons learnt from this intervention included the importance of commitment and support from teachers, parents, community agencies, and the school principal. A variety of regular, long-term activities were implemented that were enjoyable and catered for girls and boys, of all ages in the target group.

More recently, the *Western Australian Schools Physical Activity Project (WASPAN)* was implemented in 1997 (in grade six students), in response to the importance of addressing coronary heart disease risk factors that were continuing to develop in children (Medland & Taggart, 1997). This was an experimental, medically driven project, which included a physical activity program involving two sub-sections:

1. 15-20 minutes of fitness activities, three-four times per week; and
2. Two classroom based health-related fitness sessions, each lasting for 30 minutes that was directly related to the activity sessions (Medland & Taggart, 1997).

The principal aim of this program was to 'develop children with an enthusiasm for physical activity and to maintain and encourage that enthusiasm so that they become committed to pursuing an active lifestyle' (WASPAN, 1991, p.3). Outcomes of this program supported the need to focus on increasing children's activity levels in schools and environments external to the school, rather than achievements on fitness tests as a main focus. Individual activity levels were monitored through diaries, exercise and diet myths. The media and the portrayal of body image were also part of the activity and exercise sessions (Medland & Taggart, 1997). Results from one group suggested that an environment promoting high levels of continuous class participation, a variety of activities and enjoyment of such activities, could produce positive outcomes.

According to the Evidenced-Based Planning Framework for Nutrition, Physical Activity and Healthy Weight (Department of Human Services, 1998), effective interventions in this area should involve education and training strategies in primary and secondary schools. Key aspects of implementation involve both health education and physical activity, and school interventions have been found to be more effective when they are a part of a community-wide program. This will be further discussed in Chapter 6.

1.1.1.6 3.3.2.3 UNIVERSITY CAMPUSES

Limited Australian research suggests that students typically perceive themselves to be less active during tertiary education than they had been during their secondary education (Leighton & Swerissen, 1995; Leslie, Bauman, Salmon, Veitch, & Sallis, 1996). Research on the physical activity preferences of young adults has reinforced the case for promoting moderate-intensity activity, rather than focusing on vigorous exercise (Leslie, Owen, Salmon, Bauman, Sallis & Lo, 1999). A few studies have shown walking to be the most-preferred activity for inactive young adults in a community sample (Booth et al., 1997), and one of the most-preferred activities for inactive Australian tertiary students (Leslie, Owen & Sallis, 1999).

One of the most commonly identified barriers to participation in physical activity by tertiary students is the lack of convenient and accessible facilities at tertiary education campuses. The provision of appropriate facilities may encourage students to engage in physical activity during breaks between classes. One study (*ARTEC – Active Recreation on Tertiary Education Campuses*) reported a comprehensive survey of 129 tertiary education campuses in Australia, and reported that the absence of physical activity facilities, especially on new and small campuses, was related to inactivity (Leslie, Mounsey & Owen, 1998). However, it could be argued that tertiary students can participate in walking as a form of physical activity, without the need for dedicated facilities; there is some potential to promote physical activity on poorly resourced campuses through this activity.

To date, there has been only one Australian study reporting on the effects of a university campus based physical activity promotion program (Leslie, Fotheringham, Veitch & Owen, 2000). Conducted as part of the *ARTEC* project, this quasi-experimental study, was developed from earlier findings assessing student's physical activity behaviours, preferences and related attributes in a campus-based survey. These findings were used to design a campus-based physical activity program, and the outcomes were assessed by comparing self-reported pre- and post-program physical activity; similar assessments were conducted on a comparison campus which did not receive the intervention (Leslie et al., 2000). This program was implemented over an eight week period. Physical activity was assessed by deriving leisure-time participation categories from self-reported activity in the two weeks prior to the intervention. Following the campus-based programs, students at the intervention campus were more likely to be sufficiently active to accrue long-term health benefits ($p < 0.001$); those on the comparison campus showed no change in activity levels (Leslie, et al., 2000). The change in overall activity level observed on the intervention campus was due to an increase in the proportion of vigorously-active students.

Findings from this study strongly support the contention that campus settings have potential as effective environments to influence the physical activity habits of young adulthood. Settings-based approaches to the promotion of physical activity for this target group may be applied at university campuses, where facilities and infrastructure already exist to encourage such strategies. Hence, providing programs and opportunities to engage in physical activity in specific settings, may be useful in helping to promote the adoption and maintenance of regular physical activity.

3.4 CONCLUSIONS

A range of strategies for the promotion of physical activity have been applied in Australian studies. Of the population approaches to promoting physical activity, it is clear that there are many independent and government health organisations in Australia that have recently developed physical activity policies and recommendations. The success and implementation of these policies being translated into practice and resulting in increased levels of physical activity in the population will need to be monitored over time. However, as many of the theoretical paradigms suggest, without the support of public policy, it is less likely that population-wide behaviour change will be achieved (Glanz et al., 1990; McLeroy et al., 1988; Stokols et al., 1996;).

As yet there is little evidence of the success of environmental strategies for the promotion of physical activity in Australia. This is largely due to the fact that the published to date has been mainly qualitative and descriptive in nature. However, these studies suggest that this is an area with much promise, particularly with the potential for long-term, sustained behaviour change. The use of mass media strategies to promote physical activity in Australia has met with modest success. However, it is likely that this will have greater success if targeted to particular sub-groups and if it is supported with other population, environmental, and even individual approaches. The use of physical activity promotion messages through sponsorship or product labelling (guided by health promotion policy initiatives), a strategy reviewed in Chapter 2, has not been previously trialed in Australia and may be a promising approach, particularly in support of mass media approaches.

Settings-based approaches have been the most popular strategy for promoting physical activity in Australia to date. Interventions have been conducted in community settings, workplace settings, school and university settings. However, within these settings most of the strategies to promote physical activity have employed individual methods of behaviour change. In addition, although many of the interventions demonstrated short-term success, few of them evaluated long-term effects, and those that did found weak evidence of long-term maintenance of behaviour change. A multi-level approach that uses individual methods of behaviour change within a settings-based approach and includes environmental and policy support appears to be the most viable strategy for achieving sustained behaviour change in the population. The evidence for successful approaches will be further assessed in the context of international studies in the following chapter.

CHAPTER FOUR: A SUMMARY OF INTERNATIONAL PHYSICAL ACTIVITY INTERVENTIONS AND PROMOTION INITIATIVES

OVERVIEW

This chapter summarises review papers of international physical activity interventions and the most recent physical activity interventions and promotion strategies that have been published within each area. The structure of this chapter will follow the settings/contextual format presented in Chapter 3. As described in the Methods, existing reviews of the literature will be summarised and 'new' studies that were not included in the most recent review papers will be critically appraised.

4.1 POPULATION APPROACHES

As described in Chapter 3, population approaches to promoting physical activity includes studies that have used environmental and policy interventions, and mass media approaches.

4.1.1 ENVIRONMENTAL AND POLICY INTERVENTIONS

In spite of the number of health organisations and government agencies advocating changes to the environment to achieve shifts in population physical activity, there is currently little evidence regarding the effectiveness of environmental and policy interventions designed to increase physical activity at a population-level. Table 4.1 summarises reviews of environmental and policy interventions that have been conducted internationally. It is important to note that for the purpose of this summary, what is defined as 'effective' consists of those interventions that actually achieved significant behaviour change toward physical activity. However, it is also important to consider other key health promotion outcomes such as raising awareness and knowledge, as these are also effective in the promotion of physical activity, and will be further discussed. As described by the Transtheoretical Model (Chapter 2), raising awareness and increasing knowledge are important strategies for shifting people from the precontemplation stage of behaviour change (where they are not thinking about changing their behaviour), to thinking about change.

Messages to encourage people to undertake physical activity have been promoted at localities where people can choose whether they ride or walk. This approach involves placing signs in public places such as bus and train stations. An early study conducted by Brownwell et al., (1980) was among the first to demonstrate that a simple, low-cost intervention could significantly increase physical activity in a specific behaviour setting. This study was conducted at a train station with adjacent escalators and stairs. At baseline, approximately 5% of patrons were walking up the stairs. The intervention involved the posting of a sign stating, "*Your heart needs exercise, here's your chance.*" This intervention more than doubled the number of patrons who

used the stairs but, this number declined once the sign was removed (Brownwell et al., 1980). The findings from this study suggest that modest, environmental changes in key behaviour settings have the potential to promote an increase in physical activity. In another study, Blamey and colleagues (1995) reported on a similar intervention involving the posting of signs. The sign stated, *'Stay Healthy, Save Time, Use The Stairs'* and its presence increased the proportion of patrons using the stairs from 8% at baseline, to 15-17% during the intervention period. Twelve weeks after the sign was removed, although stair use remained higher than at the start of the study, there was a trend towards decreased stair use.

Studies by Vuori et al., (1994) and Linenger et al., (1991) evaluated interventions incorporating policy changes, improvements to the environment and promotion of the use of activity resources. Vuori and colleagues (1994) aimed to increase the daily commuting to work by means of walking or cycling. The intervention consisted of information distributed through worksites; lotteries were used to enhance motivation and improvements in showers and changing room facilities were made. In addition, the city government of Finland was lobbied to improve the safety of commuting routes. Upon completion of the six month intervention, 7% of employees reported commuting to work by means of walking or cycling, and 19% increased total leisure time activity (Vuori et al., 1994). In the Linegar et al. study, various environmental and policy changes were made on a military base, and the changes in reported fitness levels were compared to those at a control base. Examples of environmental improvements included installing bike trails, placing new exercise equipment in the gymnasium, opening a women's fitness centre, and organising running and cycling clubs. Policy changes included instituting release time for physical activity and obtaining budgets for the environmental changes. These changes improved the fitness of participants on the intervention base, however limitations in the design and measurement strategy limit the confidence of the conclusions.

Table 4.1: Summary of review studies of effective environmental and policy interventions designed to promote physical activity

Source	No. of studies with effective interventions	Effective strategies
Sallis, Bauman & Pratt (1998)	3	<ul style="list-style-type: none"> • Sign postings near stairways • Building new public leisure centres
Dunn, Andersen & Jakicic (1998)	4	<ul style="list-style-type: none"> • Sign postings near stairways • Sign boards promoting health benefits and weight-loss • Mail and telephone support

Roberts and colleagues (1989) reported the most extensive policy and environmental intervention to increase physical activity at a population level. Conducted in Belfast, Northern Ireland, 14 new leisure centres were opened over a seven year time frame, transforming Ireland from one of the least served areas in the United Kingdom for sports and physical activity to the best served. There was some evidence to suggest there was an increase in physical activity and sports activity among young adults, with smaller improvements noted for other age groups. The usual variation by socio-economic status (SES) was not seen, as many of the new centres were located in disadvantaged localities. Although it is intuitive that increased provision of places or facilities for physical activity leads to increased participation, there has been limited evidence of this. Cross-sectional studies have generally shown weak associations between people's perceptions of the physical activity environment (ie, availability and accessibility of facilities, green spaces etc) and reported physical activity participation. In contrast, objective measures of the physical activity environment (ie, density of facilities within a five-kilometre radius of where people live are more strongly associated with activity participation (Sallis, Hovell, Hofstetter et al., 1990). The small number of studies reviewed suggest that environmental interventions have the potential to influence population levels of increasing physical activity (Sallis & Owen, 1999).

The above studies of a Finnish workplace, a U.S. military base and Northern Ireland city are the only examples of community-wide environmental and policy approaches that could be identified in the literature (Sallis, Bauman & Pratt, 1998). Unfortunately, all studies have limitations in that their evaluation designs and had little (or no) experimental control. There were also other flaws in their methodology that limit the conclusions that can be drawn from them.

In a review of environmental and policy interventions by Sallis and colleagues (1998), two studies that evaluated reinforcement strategies for the promotion of physical activity were identified. Reinforcement strategies that have been used include providing monetary or other incentives for achieving fitness or activity goals, or discounted health insurance for walking or cycling to work. Reinforcement and lottery procedures have the potential to change incentives for physical activity that could be implemented on a population level by bodies such as health care organisations, governments, employers and insurance companies. However, studies of the effectiveness of these sorts of interventions have produced mixed results. For example, Epstein and colleagues (1980) reported that attendance at exercise classes was enhanced if monetary deposits were returned when people attended. More recently, Marcus & Stanton (1993) found that attendance did not increase among females who participated in a lottery to increase activity with a chance to win prizes. Other strategies that have been found to be less effective in changing physical activity behaviour are: additional bike trails, gym equipment; organised activity clubs; policies such as release time for activity; fitness testing; and additional shower facilities.

Suggested policies and environmental strategies to promote physical activity

King and colleagues (1995) summarised the various types of policy and environmental approaches that have the potential for promoting physical activity and reducing physical inactivity at a population level. For example, targeting of increased physical activity in all areas of daily living (including work, home, leisure time and sport) and implemented at the behaviour setting in which these activities are performed, may be a successful strategy for increasing physical activity. Examples include the promotion of passive approaches to increasing physical activity (ie. restriction of city areas to foot or bicycle traffic), using formal and informal

communication networks (involvement of many groups to form coalitions to promote physical activity), and the development and use of training mechanisms (involving state and local health departments, local program providers and community leaders as examples). Table 4.2 lists examples of environmental strategies and organisational policies that may have the potential to promote regular physical activity.

Table 4.2: Potentially useful policies and environmental strategies to promote physical activity

Community Wide	<ul style="list-style-type: none"> • Safe footpaths in business and residential localities • Central Business District areas restricted to foot and bicycle pedestrians • Safe bike and walking tracks in close proximity to schools • Access to safe sport facilities during convenient hours • Attractive and safe parks and play areas
Workplaces	<ul style="list-style-type: none"> • Well-lit, convenient and safe stairways • Safe and convenient bicycle parking area • Shower and change room facilities on site for employees who engage in physical activity • Financial incentives for fitness and commuting to work by walking and cycling • Health insurance discounts to regularly active employees
Schools	<ul style="list-style-type: none"> • Facilities to promote regular physical activity and accommodate school sporting events • Safe and well-lit stairways • Safe and convenient areas to store bicycles • Safe and attractive walking areas around the school and surrounding nearby parking lots • Walking, jogging and bike paths on school grounds
Health Care Setting Policies	<ul style="list-style-type: none"> • Provision of regular training updates on physical activity for health care providers • Assessment and advice of patients about their physical activity practices • Financial incentives for health care providers for conducting physical activity assessments

(Source: King, 1995)

In 1998, the Department of Human Services (DHS) released an evidenced-based planning framework for nutrition, physical activity and healthy weight (Department Human Services,

1998). That report provided a summary of effective interventions and strategies designed to increase physical activity. Table 4.3 identifies environmental support, including effective approaches that encourage a supportive physical and social environment.

The published reviews on environmental and policy interventions have considered such initiatives up to 1997. A literature search was therefore performed to identify more recent published studies that have included strategies within an environmental and policy framework. However, results of this search found no new published international studies using this framework.

Table 4.3: Effective approaches that promote and encourage supportive physical and social environments

Effective Interventions	Key Aspect of Implementation
Improving access to recreational facilities, services and clubs	<ul style="list-style-type: none"> • Facilities must be safe, attractive and clean and linked to additional transport routes
Encouraging people to walk up the stairs	<ul style="list-style-type: none"> • Strategically placed signs encouraging the use of stairs as opposed to the lifts
Creating transport options that encourage physical activity	<ul style="list-style-type: none"> • Encourage and support local and state governments to improve and extend commuter and recreational bike paths and lanes • Encourage governments to improve and extend public transport
Providing and encouraging ongoing recreational programs for people with disabilities	<ul style="list-style-type: none"> • Centres may provide the development of day programs for people with mental/physical disabilities or who are socially isolated • This may involve networking with other providers to gain referrals • Centres may be required to provide a range of times for programs suitable for those with special needs

(Source: Department of Human Services, 1998)

In summary, environmental interventions offer the best long-term prospects for change and implementation of the National Physical Activity Guidelines, since they can potentially support sustained behaviour change in wider segments of the population. The use of environmental approaches to increase physical activity in Australia is a relatively new strategy and is gaining popularity. Indeed, it has been argued that interventions that ignore environmental influences are more likely to fail (Egger et al., 1999). To date, there is a lack of supportive empirical

evidence for environmental interventions (Sallis et al., 1998). According to Egger and colleagues (1999), 'Future approaches to increasing physical activity at a population level will need to incorporate environmental influences into program planning, and these influences should (where possible) be attempted to be modified.' (Egger et al., 1999 p.120). In addition to environmental modification and policy change which are long-term strategies, educational and/or motivational approaches (e.g., changes to the information environment) may result in more immediate outcomes (Brownell et al., 1980; Sallis et al., 1998).

4.1.2 MASS MEDIA INTERVENTIONS TO PROMOTE PHYSICAL ACTIVITY

For the general population, the media can play a variety of health promotion roles (Donovan and Owen, 1994) including:

- increasing the perceived importance of physical activity as a health issue
- communicating the benefits of physical activity and other health benefits
- generating awareness of physical activity programs
- promoting role models in physically active lifestyles

The effectiveness of different forms of media (i.e. print and broadcast media) as a sole intervention promoting either the adoption or maintenance of physical activity is largely unknown, as many of the systematic evaluations have shown mixed results (USDHHS, 1996). A variety of mass media strategies have been applied to most physical activity public health campaigns, but it has been difficult to distinguish the effects of the media from other interventions that have also been applied at the same time (King, 1991). A summary of international studies that have reviewed the effects of mass media and the promotion of physical activity is presented in Table 4.4. It is important to note that for the purpose of this summary, what is defined as 'effective' consists of those interventions that actually achieved behaviour change toward physical activity, and/or also achieved increased awareness, changes in attitudes to physical activity and increased knowledge. As described in Chapter 2, the likelihood of achieving behaviour change from mass media interventions alone is minimal. Therefore, it is important to consider other key outcomes such as raising awareness and knowledge.

In the review by Marcus and colleagues (1998), it was found that one out of the five international mass media interventions reported increased physical activity knowledge and awareness; three international studies reported increases in physical activity behaviour. Overall, the published reviews suggest that where mass media is used as the main strategy, it is effective in raising awareness, but has a limited influence on behaviour change (Marcus et al., 1998; Cavill, 1998). Recent mass media campaigns have included assessments of physical activity behaviour change, however, most have promoted several behaviours associated with cardiovascular risk reduction, with physical activity as one component (Osler et al., 1993; Luepker et al., 1994;

Young et al., 1996). As such, it is difficult to identify resources specifically targeted to physical activity behaviours, as opposed to more general cardiovascular disease risk factors.

In a sub-study of the *'Pawtucket Heart Health Program'* (Marcus et al., 1992), both a public health approach and an individual behaviour-change model was used. In a sample of 400 adults (mainly female), the stage of motivational readiness for exercise adoption was assessed in the community, and stage-matched self-help manuals were delivered to participants. Evaluation findings indicated that 30% of those thinking about changing physical activity at baseline, and 60% of occasional exercisers had initiated regular exercise 6 weeks after the intervention (Marcus et al., 1992).

Table 4.4: The effectiveness of international health promotion campaigns that used mass media to promote physical activity

Source	Number of studies with effective interventions for behaviour change	Effective Strategies	Number of studies with effective interventions for other key outcomes	Effective Strategies
Marcus et al., (1998)	3	<ul style="list-style-type: none"> • Motivation-matched self-help print materials • Community events & community leadership involvement • Telephone helpline ("Fitline") • Support booklets 	1	<ul style="list-style-type: none"> • TV advertisements • Role modelling • Telephone helpline
Cavill (1998)	1	<ul style="list-style-type: none"> • Telephone helpline ("Fitline") • Support booklets 	1	<ul style="list-style-type: none"> • TV advertisements • Role modelling • Telephone helpline

On a larger scale, the '*Minnesota Heart Health Program*' (MHHP) involved 400,000 individuals from six mid-western communities in America. Over a 5-6 year period, strategies including mass media, community events and community leadership involvement were adopted and focused on promoting physical activity through local health professionals and community organisations. Luepker et al., (1994) reported that physical activity prevalence increased at rates above the secular trend, and this was particularly noted for the first 3 years of program implementation. Further, there were small increases in kilocalories per day expended in leisure-time physical activity noted in the early years, although this declined in the later years.

More recently, Young and colleagues (1996) reported on the '*Stanford Five-City Project*' (SCFP), which involved four cities in central California, with a fifth community used for surveillance purposes only. The SCFP intervention included a number of elements designed to increase physical activity in the intervention communities over a six year period. There was heavy reliance on the delivery of information using print and electronic media, however compared to the MHHP, there was a greater emphasis on print and broadcast media. The SCFP placed more emphasis on nutrition, weight control, blood pressure and smoking than on physical activity. The only significant findings were that men in the intervention cities increased their daily energy expenditure and engagement in vigorous-intensity activities. Women in the intervention cities increased their participation in moderate-intensity physical activity. It should be acknowledged however, that these improvements in physical activity were marginal, and inconsistent between the 4 treatment cities (Marcus et al., 1998).

The mass media campaigns reviewed so far in this section have used multiple channels including television, radio announcements, print materials and community events. In addition, walking was promoted as the main form of exercise. Social marketing and social cognitive theories were used to guide the design and implementation of these campaigns. Findings from these studies suggest that the message recall tends to be high (~70% across studies), indicating mass-media campaigns communicate on a basic level to broad segments of the population (Marcus et al., 1998).

One international initiative that has used a different approach is that of the Scottish campaign (Wimbush et al., 1998). The Health Education Board of Scotland used a television advertisement featuring a well-known rugby player (as a role model), who revealed some 'surprising facts' associated with walking compared with other forms of exercise. The television advertisement ran in conjunction with a telephone help-line ('FitLine'). The evaluation of this campaign involved pre-and-post random population surveys, as well as a follow-up survey amongst the help-line users. The main outcome measures assessed included campaign awareness and measures of knowledge, motivation, beliefs and intentions regarding walking and walking behaviour. The results revealed that awareness of the television advertisements was high (70%), following the first round of advertising and increased measures of knowledge and beliefs toward walking were reported. There was also some changes in attitudes to exercise, however, there was no changes in overall exercise behaviour. A separate survey was administered to the help-line users and these findings suggested that the campaign had a strong impact on the level of intentions towards exercise and actual behaviours. At 12-month follow-up,

48% of help-line users reported being more physically active. However, it should be noted that this proportion only represented between 0.1-1% of the population. Nevertheless, the help-line was seen to be a cost-effective means of encouraging those individuals in the contemplation stage of behaviour change for activity (Cavill, 1998). This campaign demonstrated how attitudes and knowledge toward physical activity could be influenced by mass media approaches (Wimbush et al., 1998).

Mass media-based campaigns and initiatives have been in progress across Europe and the United States over the last few years. These campaigns have been recently completed, therefore, results are not yet available. However, some lessons may be learned from the approaches that have been applied.

The largest-scale intervention is the *'Active for Life'* campaign, which was implemented for three years by the Health Education Authority of England between 1996-99. This campaign aimed to promote moderate-intensity physical activity as a part of everyday life (Quinney et al., 1992). This campaign combined television advertising with unpaid media and other communication strategies, as well as programs to support professionals working on community-based projects. A variety of communication strategies were used, including unpaid advertising on the side of over seven million cereal boxes. *'Active for Life'* was guided by the use of social marketing principles (Quinney et al., 1992). It also used market segmentation, identifying a number of key groups for message delivery.

There have been a number of countries across Europe that have focussed on walking initiatives. Increasing attention has been directed towards prompts encouraging physical activity. For example, the *'Sli na Slainte'* (Way to Health) project was initiated in Ireland, and has since been adopted by five other countries. This project aimed to increase access to safe and pleasant walking environments by sign-posting the appropriate walks and linking them with relevant health advice (Irish Heart Foundation, 1997). A variety of support materials including leaflets and advice sheets were available to walkers, and advertising was conducted via local media and at train stations. The Irish Heart Foundation (1997) reported that the marking of walking routes has increased walking participation.

'Physical Activity: It's Everywhere You Go' is a new campaign in America, developed by the Centres for Disease Control (CDC) to promote moderate-intensity activity amongst adults. The theme of the campaign reinforces the importance and health benefits of regular physical activity and focuses on simple ways to incorporate daily exercise such as climbing the stairs instead of the escalator. This campaign was developed by health professionals and community leaders across America and consists of a print-media and audiovisual marketing kit. Components of this kit included messages featuring well-known role models, radio advertisements, colourful posters and print advertisements. By analysing market research data, as well as conducting focus groups and interviews, the CDC was able to ascertain a descriptive picture of the intended audience, which was subdivided according to behavioural stage according to the TTM (Marcus et al., 1998).

Summary

To date, there have been virtually no controlled research studies evaluating the effects of community-based mass-media physical activity programs. The use of mass media appears to be successful in promoting awareness and interest in participating in physical activity, but has had minimal success in actually changing exercise behaviours (Marcus et al., 1998). Mass media communication is most likely to be effective in influencing the knowledge and attitudes of those who are at the earlier stages of the exercise adoption process, particularly pre-contemplators and contemplators. The studies that have been conducted demonstrate however, that it is possible to use mass media to elicit changes in knowledge and attitudes in relation to physical activity. Mass media offers great potential as a part of a broad umbrella of health promotion strategies, particularly when applied with community-based initiatives (Reid, 1996). Mass media campaigns also have an important role in influencing the climate of public opinion in favour of promoting public policy (Cavill, 1998).

4.2 INDIVIDUAL APPROACHES

This section reviews published International studies which have evaluated individual approaches.

4.2.1 INFORMATIONAL APPROACHES

Perhaps the only informational approach to the promotion of physical activity to receive serious attention in the research literature to date, is health practitioner counselling. There have been several recent reviews of this approach (Ashenden et al., 1997; Eaton et al., 1998; King et al., 1992; Simons-Morton et al., 1998). On the basis of a review of six randomised trials, Ashenden and colleagues (1997) concluded that the outcomes from interventions of this type were variable, but generally positive. The interventions reviewed varied in duration and intensity, so the inconsistent overall findings across the six trials was not surprising.

Eaton and colleagues (1998) suggested that the evidence for the efficacy of primary care interventions was modest. This review, examining eight studies from the United States, the United Kingdom and New Zealand, found physical activity was increased in the short term, but that, even with repeated interventions, the long term effects of these interventions were weak. The review by Simons-Morton and colleagues (1998), examining 12 international studies, produced similar conclusions.

4.2.2 PRINT- AND WEB-BASED APPROACHES

A considerable number of international trials of print-based self-help physical activity strategies have utilised techniques suggested by the Transtheoretical Model, such as goal setting (King, Taylor, Haskell, et al. 1988), decisional balance (Marcus & Stanton, 1994), relapse prevention training (Kau & Fischer, 1974), stimulus control strategies (Blair, Piserchia, Wilbur, Crowder, 1986) and social support (King, Haskell, Taylor, et al. 1991) to promote changes in physical activity participation. Interventions targeting self-efficacy and decision-making strategies have accumulated significant support (Marcus, Bock, Pinto, et al. 1998).

Other studies have reported significant increases in physical activity behaviour as a result of the motivationally-tailored intervention (Cardinal & Sachs, 1995, 1996; Dunn, Marcus, Kampert, et al. 1997; Jarvis, Friedman, Heeren, Cullinane, 1997; Marcus, Bock, Pinto, et al. 1998). Similarly, studies have reported that printed materials based on a 'stage of change' paradigm led to greater improvements in physical activity behaviour than did standard print materials.

In international studies, as in the Australian studies, print-based strategies have often been included as part of broader campaigns. *The Stanford Five-City Project* is a key example of the use of mass media outreach campaigns in combination with print-based strategies and localised strategies (Marcus et al., 1998). Sixteen-page physical activity promotion booklets were distributed to 25,000 individuals, in parallel with mass media campaigns and local events. Results from this program indicate that physical activity knowledge increased for men and women in independent cohort samples, and that the face-to-face strategies, including the use of print booklets, were more effective in promoting physical activity than the mass media efforts.

As identified in Chapter 2, use of the Internet as a communication medium for health promotion is likely to become an important area for researchers and health promotion practitioners. The use of Information Technology in promoting physical activity is being tested in *Project PACE+* (Prochaska, et al., 2000). This program uses computer-based questionnaires to generate on-screen advice, and is administered in physician's consulting rooms. This program was developed from previous paper-based assessments to more-rapidly provide feedback and advice to participants. The *PACE+* program has been shown to produce moderate changes in physical activity participation amongst small samples of adults and adolescents (Prochaska, et al., 2000).

Preliminary findings from recent and current investigation of the use of Information Technologies in the promotion of physical activity suggest that this is a potentially promising area for health promotion practice.

4.3 SETTINGS-BASED APPROACHES

As described in Chapter 2, it is important to consider population and individual approaches applied in different settings. The context and behaviour setting (see Figure 1, Chapter 1) provide a means of identifying and working with individuals and populations. Furthermore, the context

and behaviour setting is key in operationalising many of the theoretical models of behaviour change. For example, social cognitive theory emphasises the interactions between the behaviour of individuals, their social context and the environment.

4.3.1 COMMUNITY SETTINGS

As reviewed above, many of the large population-based studies that used mass media approaches also employed community-based approaches (Marcus et al., 1998). Chapter 2 describes the application of a community-based approach to the promotion of healthy behaviour. There have been very few controlled research studies evaluating the effects of community-based physical activity programs. Taken together, these studies have demonstrated little effect or impact on behaviour change. However, a recent review of studies within community settings that targeted increased physical activity among older adults, identified 19 community-based intervention studies which were successful in achieving behavioural and/or physiological changes, four studies had mixed results, and two studies showed no effect (King, Rejeski & Buchner, 1998). Effective strategies employed in these interventions are summarised in Table 4.5. Unfortunately, changes in awareness, physical activity attitudes and knowledge were not reported in this review, thus the effective strategies described in this table refer to demonstrated changes in behaviour.

The review found that cognitive behavioural strategies were the most effective for behaviour change (King et al., 1998). Health education/instruction has been found to be an ineffective strategy by these same authors. In addition, a group-based activity program as a sole intervention strategy has been found to be less effective than a combined group- and home-based format. King and associates (1998) recommend: intervention methodologies that compare multiple strategies, rather than comparing an intervention with a control group; further studies to increase understanding of physical activity across the lifespan; programs that intervene across generations ('intergenerational'); and the use of theoretical models and frameworks to guide the development of physical activity interventions. The use of "environmental interventions could be combined with behavioural and educational programs to enhance the success of the intervention" within the community setting (King et al., 1998, p.330).

Table 4.5: Summary of reviews of the effectiveness of international community-based physical activity intervention programs for older adults

Source	Number of studies with effective interventions	Effective Strategies
King et al., (1998)	19	<ul style="list-style-type: none"> • Behavioural or cognitive-behavioural strategies (goal-setting, self-monitoring, feedback, support, relapse-prevention) • Efficacy-based adherence instruction • Combining home- and group-based formats • On-going telephone supervision

4.3.2 WORKPLACE SETTINGS

Workplaces have the potential as settings for health promotion programs (including physical activity initiatives), for the reasons described in Chapter 2. The majority of workplace studies have been conducted in the USA, with others in Europe and England. Table 4.6 summarises the international reviews that have assessed the effectiveness of interventions on physical activity in the workplace. We include only those reviewed studies that report on life satisfaction and general well-being, fitness parameters such as aerobic power, strength and flexibility, and those that contained a sample of thirty participants or more. Other outcomes such as changes in body mass, body fat percentage, smoking and other lifestyle health behaviours are not reviewed here. Overall the current evidence suggests there are few data available on the effectiveness of workplace physical activity programs. These kind of programs often lack rigorous and systematic evaluation due to factors including budget constraints, inadequate expertise to conduct evaluations, or disinterest shown by the employer.

Shephard (1996) conducted a comprehensive review of studies that assessed the evaluation methods and health impacts for participants and the average employee (see Table 4.6). Twenty-two studies (with $n > 30$) reported on life satisfaction, general well-being, and other psychological parameters, and fitness parameters such as aerobic power, strength and flexibility. Some effect from intervention strategies for one of the above parameters was found in 19 of the 22 studies. However, it is difficult to draw conclusions from this review due to the variable quality of the data, and the methodological differences between workplace initiatives. Despite this, improvements in fitness and reductions in other risk taking behaviours were reported amongst program participants, although an overall population effect was limited by low participation rates. These

improvements were only shown by employees who were regular program participants; generally, these represented a small proportion of eligible individuals. Of particular interest, many of the reviewed studies reported other important outcomes such as enhanced well-being, reduced stress, and positive effects on workplace morale (Shephard, 1996). However, it is not clear whether these improvements are due to the exercise program or because of more positive employee perceptions of management.

Table 4.6: Summary of reviews of the effectiveness of workplace interventions designed to promote physical activity

Author/Year	Number of studies with effective interventions	Effective Strategies
Shephard (1996)	19 (+15 with weak effects)	<ul style="list-style-type: none"> • Circuit interval training • Medical screening, fitness tests, exercise prescription • Structured support • Health and fitness program for blue collar workers that emphasise flexibility • Contracts, lotteries, incentive contests • Educational programs • Counselling and feedback • Changes in corporate culture for program compliance • Indoor/outdoor exercise facility • Exercise breaks (twice/shift) • Non-competitive/unstructured program
USDHHS (1996)	2 (+ 1 with weak effects)	<ul style="list-style-type: none"> • Screening lifestyle seminar • Exercise programs • Newsletters, contests, health communication • Outreach and counselling to all employees and those at highest risk
Heaney & Goetzel (1997)	7 (+ 2 with weak effects)	<ul style="list-style-type: none"> • Screening, health risk appraisal, referral and feedback, counselling • Skills based reduction modules, health education, educational materials • Environmental modifications, exercise facilities • Goal setting and contracting • Computer generated feedback

		<ul style="list-style-type: none"> • Team-based competition
Dishman (1998)	0*	<ul style="list-style-type: none"> • Behaviour modification • Workplace physical activity incentives
Pelletier (1999)	1 (weak effect)	<ul style="list-style-type: none"> • Work and family policies (flexi- time) • Childcare • Health education, health screening • Exercise and recreation • Modifications to work environment

- Using meta-analyses, none of the effects on physical activity were statistically significant

Participation in programs does not appear to increase proportionally to the investment in exercise facilities and equipment (Shephard, 1996). Strategies that were shown to be ineffective were compulsory daily exercise regimens; structured exercises or activities (e.g., calisthenics, aerobic dance, running and other games); health education; and risk appraisal. Reviews by Shephard (1996), and the US Surgeon General (USDHHS, 1996) concluded that controlled studies of workplace programs are rare. Both of these reviews report on the limitations that reduce the effectiveness of interventions, and that warrant attention for future programs, such as, low recruitment of workers, high drop-out rates, and poor maintenance of the programs, and behaviour change. If the program responses are averaged across entire companies, the improvements and benefits of health related fitness are small (Blair, 1986). It has been suggested that a more cost effective strategy for future physical activity interventions would be to provide access to a well equipped facility, combined with outreach, individualised counselling, and a corporate environment that is supportive of an active lifestyle (Heireich, 1993).

Results from randomised controlled trials suggest that providing opportunities for individual risk reduction counselling for high risk employees within the context of comprehensive programming may be the vital component of effective workplace health promotion programs (Heaney & Goetzel, 1997). It appears that short duration, low-intensity programs in the workplace aimed to increase awareness of health issues may not be sufficient to achieve health outcomes (Heaney & Goetzel, 1997). Randomised controlled trials that compare comprehensive public health approaches combined with individualised behaviour counselling would be important in furthering our understanding of what constitutes an effective intervention (Pelletier, 1999). However, a meta-analysis of workplace physical activity studies by Dishman and colleagues (1998) was not favourable. This review suggested workplace health programs only had a modest effect, not significantly different from zero. Further, this review concluded that the average workplace

health program was yet to demonstrate a statistically significant increase in physical activity or fitness (Dishman et al., 1998). Interventions that used behaviour modification (as the sole intervention) were associated with medium size effects, as were those interventions delivered at a university workplace, or with the presence of additional incentives for participation (Dishman et al., 1998).

Table 4.7 provides a list of recent studies that have reported physical activity interventions at the work place. A selection of programs that yielded promising approaches and outcomes are also reviewed. The study by Marcus and colleagues (1998), compared the efficacy of a self-help intervention tailored to the individuals' stage of motivational readiness for exercise adoption with a standard self-help exercise promotion intervention. This was conducted in eleven workplaces participating in the *Working Healthy Research Trial* in the USA. Participants were randomized into one of two treatment conditions: (1) motivationally tailored, or (2) standard materials. For the intervention completers, (in comparison to those in the control), those receiving the motivationally tailored intervention were significantly more likely to show increased motivational readiness, and less likely to show either no change or regression in stage of motivational readiness.

Further, changes in stages of motivational readiness were significantly associated with changes in self-reported time spent in exercise (Marcus, Emmons et al., 1998). These findings appear to support treatment approaches that tailor interventions to the individuals' stage of motivational readiness for exercise adoption and warrant consideration for future physical activity initiatives.

Table 4.7: Summary of reviews of International studies of physical activity interventions in the workplace

Source	Study Objective	Strategies Applied	Major Findings
Hallam & Petosa (1998)	Examined the impact of a 4-session workplace intervention on selected social cognitive theory variables linked to adult exercise adherence (USA)	<ul style="list-style-type: none"> • 4X 1 hour informational sessions related to exercise and physical activity 	Social cognitive theory variables associated with the adoption of an exercise program were significantly changed
Marcus, Emmons et al., (1998)	Compared the efficacy of a self-help intervention tailored to individuals' stage of motivational readiness for exercise adoption, in 11 workplaces participating in the Healthy Working Research Trial (USA)	<ul style="list-style-type: none"> • Printed self-help exercise promotion materials either: <ul style="list-style-type: none"> - (1) motivationally tailored; or - (2) standard materials 	Treatment approaches that tailored interventions to individuals' stage of motivational readiness for exercise adoption were found to be significant
Emmons, Linnan et al., (1999)	Reports on results from The Working Healthy Project: a health promotion trial targeting physical activity, diet and smoking in 26 USA manufacturing workplaces	<ul style="list-style-type: none"> • Informational, educational and motivational materials • Self-assessment with feedback • Self-help/self-skills management programs • Contests, incentives • Direct education • Changes to catering and smoking policies • Enforcement of policy 	Significant increases reported in frequency of exercise behaviour

The Working Healthy Project (Emmons et al., 1999) was a recent study that reported on a workplace health promotion trial targeting physical activity, diet and smoking. *The Working Healthy Project* was a multiple risk factor intervention delivered in 26 manufacturing workplaces in the USA. The intervention aimed to increase fruit/vegetable consumption, increase fibre intake, decrease fat intake, to increase physical activity and to stop smoking. The intervention included individual and organisational-level strategies. Results from this study indicate that participants in the intervention condition had significantly increased their exercise behaviour, compared to the control condition. Furthermore, subjects in the intervention condition progressed in their stage of readiness for physical activity, and fewer experienced stage regression from baseline to final assessment points, compared with the subjects in the control condition (Emmons et al., 1999). These results suggest that among a cohort of participants in a workplace health promotion study, there were significant health behaviour changes involving two risk factors over the duration of the intervention. These findings indicate that further investigation of multiple risk factor workplace health promotion is warranted (Emmons et al., 1999), particularly with a focus on ways to increase participation by workers, including those from low-minority or disadvantaged groups.

In addition to the most recent international interventions described in Table 4.7, Burn and associates (1999) examined the relationship between CHD risk factors and stage of exercise adoption for individuals participating in a workplace lifestyle screening program. Participants were recruited from a government office in England, and were required to complete a self-report physical activity and health-related questionnaire. This study found that aerobic activity levels and self efficacy were significantly different across the stages of exercise adoption (Burn et al., 1999). Differences were significant between the early and the later stages of exercise adoption, and those in the early stage ('precontemplators') were older, more sedentary, and less likely to adopt physical activity, compared to those in the later stages. This suggests that programs designed for individuals in the preparation and action stages of change will exclude those with the highest CHD risk. Hence, the importance of tailoring health intervention programs to incorporate stages of change was highlighted for future application (Burn et al., 1999).

Summary

Currently, there appears to be insufficient evidence to determine the elements needed for successful physical activity programs in the workplace (USDHHS, 1996). Factors such as poor recruitment, low participation rates, and high drop-out rates have impeded the level of success of these types of interventions. However, strategies including lotteries, incentives, prizes, and social systems for physical activity show potential for increasing participation in physical activity programs in the workplace. Few of the workplace studies reported physical activity participation, and used physiological parameters only. It would be extremely useful to know the generalisability of these programs to other settings. For example, the extent to which a workplace physical activity program transfers or translates to other behaviour settings or functions, such as during leisure-time or at home, or even translates to increased incidental physical activity choices (see Figure 1).

According to Sallis and colleagues (1997), policy and environmental interventions show the most promise for increasing physical activity levels, as they are designed to have an impact on all employees (Sallis et al., 1997). Despite the fact that few studies have examined the effects of environment and policy intervention approaches in the work-place, thoughtful environmental modifications may produce increases in physical activity without conscious effort (Sallis et al., 1997). A number of policy and environmental interventions could be applied in the workplace and these include:

- Competitions to encourage stair use;
- Providing subsidies to off-site health facilities;
- Providing subsidies for non-motorised commuting to work;
- Providing showers and change room facilities in buildings, and providing secure storage areas for bicycles.

Many workplace interventions have been found to be ineffective because they did not utilise the workplace environment and organisation in an optimal manner. American investigators have tended to highlight the individuals' responsibility for personal health. In contrast, environmental and organisational strategies that have been more fully developed in European workplaces have considerable more potential as a method for promoting and increasing physical activity. The appropriate use of environmental and policy strategies (as described in Chapter 2) in conjunction with behavioural models that are individually tailored, show promise for guiding workplace initiatives to increase physical activity (Dishman et al., 1998).

4.3.3 SCHOOL AND UNIVERSITY SETTINGS

Schools

As the majority of young people aged 6 –16 years attend school, schools offer an almost population-wide setting for promoting physical activity to young people, primarily through classroom curricula for both physical and health education (USDHHS, 1998). To date, the most extensive and promising research on interventions for promoting physical activity among young people has been conducted at the primary/elementary school level. Table 4.8 summarises the international review papers of physical activity interventions conducted in school-based settings. Findings of interest are also reviewed in this section. The majority of school-based studies have focused on short-term outcomes. Few studies have examined long-term behavioural effects. In addition, there is limited evidence concerning the effectiveness of school-community based programs (USDHHS, 1996).

The published review papers consistently identified several effective strategies for promoting physical activity in schools. Classroom physical education sessions lead by specialists and specially trained teachers; behaviour-based modules and curriculum; and peer involvement in physical activity programs have all been found to be useful. In addition, programs that combine multiple strategies and that focus on individual behaviour and the school environment have the greatest potential for promoting physical activity in schools. In contrast, ineffective strategies have included: health screening; health workshops; feedback; and incentives for attending physical activity classes.

Table 4.8: Summary of review studies of international school-based physical activity interventions

Source	Number of studies with effective interventions	Effective Strategies
USDHHS (1996)	5	<ul style="list-style-type: none"> • Classroom physical education sessions • Health risk reduction curriculum, behaviour based modules and curriculum • Physical education provided by specialists and specially trained teachers • Peer-led physical education challenge
Baranowski, Andersen & Carmack (1998)	5	<ul style="list-style-type: none"> • Classroom physical education sessions, changes in school-based physical education • Health risk reduction curriculum, behaviour based modules and curriculum • PE provided by specialists and specially trained teachers • Peer-led physical education challenge • Cognitive and behaviour skills taught to modify behaviour • Guide book, activity box
Stone, McKenzie, Welk & Booth (1998)	6	<ul style="list-style-type: none"> • Classroom physical education sessions, changes in school-based physical education and policy • Health risk reduction curriculum, behaviour based modules and curriculum • Physical education provided by specialists and specially trained teachers • Peer-led physical education challenge, parent and peer involvement • Cognitive and behaviour skills taught to modify behaviour • Guide book, activity box, media • Free fitness demonstration

Recent international studies and evaluations of physical activity interventions conducted within a primary/elementary level are described in Table 4.9. Manios and colleagues (1999) conducted an evaluation of a health and nutrition program in primary school children in Crete (Greece), over a six year period. Students in the first grade from a representative sample of 40 schools were assessed for health knowledge, physical activity and fitness. The same measurements were repeated three years after the program on 228 intervention pupils and 183 control pupils (Manios et al., 1999). The intervention was education based, consisting of multi-component workbooks (covering dietary issues, physical activity and fitness, as examples), as well as PE classes taught by instructors, and additional teaching aids were supplied. This study reported greater increases in health knowledge, physical activity and fitness levels in the intervention group compared to the controls. The short-term changes are encouraging and indicate potential for improvement and development, however, expansion of such a program may be beneficial for initiating long-term changes (Manios et al., 1999).

The Eat Well and Keep Moving program (Gortmaker et al., 1999) evaluated a school-based health behaviour intervention on diet and physical activity among 4th and 5th grade students in America. This study was a quasi-experimental field trial, with six intervention schools and eight matched control schools. *The Eat Well and Keep Moving Program* was taught by classroom teachers over a two year period. Intervention materials focussed on reducing the consumption of foods high in total and saturated fat and increasing fruit and vegetable intake, as well as reducing television viewing and increasing participation in physical activity. In relation to physical activity levels, there was no significant improvements, but the amount of time devoted to television viewing marginally decreased post-intervention. Conclusions drawn from this study indicate that the *Eat Well and Keep Moving Program* is effective in improving dietary intake of students and can reduce television viewing amongst this target audience. However, as the program did not report increases in physical activity, future attention should be directed toward this goal. As argued in Chapter 5, sedentary behaviours such as television viewing, are important to consider in their own right, and have been shown to have health outcomes independent of physical activity. It is therefore important that time spent watching television is instead spent on physical activity, and is not replaced by other sedentary behaviours.

Table 4.9: International studies of physical activity interventions conducted in a primary school setting

Source	Study Objective	Strategies Applied	Major Findings
Manios et al., (1999)	Evaluation of a health and nutrition program in primary school children in Greece	<ul style="list-style-type: none"> Multi-component workbook (diet, physical activity, fitness, dental health, smoking, accident prevention) Teaching aids, physical education instructors, practical sessions of physical education 	Increases in health knowledge and physical activity were significantly higher in intervention students compared to controls
Gortmaker et al., (1999)	A school based health behaviour intervention to increase physical activity, decrease television viewing, and to increase healthy eating	<ul style="list-style-type: none"> Educational, curriculum-based Practical sessions of physical education 	Effective in reducing dietary fat intake and television viewing. No significant effects shown toward increasing physical activity
Robinson (1999)	To assess the effects of reducing television viewing, video use, and electronic game use on changes in adiposity, physical activity and dietary intake	<ul style="list-style-type: none"> 18 lesson and 6 month classroom curriculum to reduce television viewing, videotape and video game use 	There were no significant intervention effects on reports of children's physical activity levels or performance. Significant reductions in adiposity were found

Secondary School Programs

Few recent studies have evaluated the effectiveness of secondary school programs targeting the level of physical activity in students. Studies from the 1980's have successfully demonstrated positive effects resulting from programs that have been aimed at young people. Examples include the *Stanford Adolescent Heart Health Program* (Killen et al., 1988), *Slice of Life* (Perry et al., 1987) and *Project Active Teens* (Dale et al., 1988). There

are a number of school-based studies from the late 1990's still in progress, and the results of which are yet to be published.

Two school health promotion studies resulted in different outcomes and degrees of success in effectively achieving behaviour change (Table 4.10). Moon and colleagues (1999) evaluated the *Wessex Healthy Schools Award* scheme (WHSA). This intervention aimed to change school health promotion policy and practice, and influence health related knowledge, attitudes and behaviour of students. This study was conducted in eleven secondary schools and five control schools in England. The measurement of change in school health promotion was assessed by audit: students' health-related knowledge, attitudes and behaviour through self-administered questionnaires; attitudes of perceptions of staff, parents and governors from semi-structured interviews (Moon et al., 1999). Results indicated that audit scores for physical activity did not increase in the intervention schools (Moon et al., 1999). The students' knowledge towards health related behaviours was high at baseline, and remained unchanged in the intervention schools. Only modest effects were shown in physical activity behaviour. However, girls made greater progress in health knowledge, attitudes and behaviour compared to boys. Even though parents and non-teaching staff supported the school health promotion and were involved in the program, it was not successful in significantly increasing participation in physical activity. However, the program was successful in changing smoking and drug use behaviour.

The evaluation of the '*Planet Health*' program in America has recently been published (Gortmaker et al., 1999). Planet Health was a school-based obesity intervention program that aimed to modify key physical activity and dietary risk factors including reducing the amount of television viewing hours. This program involved American students in grades six and eight (n=1295) and was integrated with existing classroom subjects. The program was implemented in five intervention and five control schools, and was largely informed by concepts drawn from Behavioural Choice Theory and Social Cognitive Theories of individual behaviour change. Obesity was the primary outcome of interest; and secondary outcomes included self-reported TV viewing, and participation in moderate and vigorous physical activity. Reductions in reported TV viewing time were found for both boys and girls (Gortmaker et al., 1999). Although there were no statistically significant changes in physical activity, reductions in students' TV viewing time indicate that a focus on changing this sedentary behaviour may be important in future interventions.

Table 4.10: International studies of physical activity interventions at a secondary school setting

Author/Year	Study Objective	Strategies Applied	Major Findings
Moon et al., (1999)	3 year evaluation study of the effectiveness of the 'Wessex Healthy School Award' intervention	<ul style="list-style-type: none"> • Curriculum • Links with wider community • School based changes and initiatives • Policy reviews • Physical education, teaching and support staff • Observations of health education lessons and school environment • Parental involvement 	Only modest effects shown in physical activity behaviour, girls achieved greater progress in all areas compared to boys
Gortmaker et al., (1999)	A school based health behaviour intervention to reduce obesity	<ul style="list-style-type: none"> • Planet Health sessions were included within existing curriculum using classroom teachers in 4 major subjects and physical education 	No significant changes in physical activity levels, however, reductions of TV viewing time were reported

University Campuses

Physical activity levels of males and females decrease during the teenage years and young adulthood, while the prevalence of inactivity rises (Leslie, Fotheringham, Owen & Bauman, 2000). This makes the study of influences on physical activity important for this age group. There has been only one international study that examined the effects of physical activity interventions within university campuses. Sallis and colleagues (1999) reported on *Project GRAD (Graduate Ready for Activity Daily)* a university course to promote physical activity. This was a randomized study consisting of 388 university students, participating in either an intervention or control group for academic credit. Post-test data were available from 321 participants. The intervention course taught behaviour change skills in weekly lectures and peer-led laboratories, the control course was knowledge-oriented (Sallis et al., 1999). Physical activity was assessed by a seven-day Physical Activity Recall interview. Findings from this study indicate that positive effects were reported on total energy expenditure for initially active women. Women also reported greater strengthening and flexibility exercise. No significant intervention effects were shown in men. Interestingly, this program had the intended effects of promoting healthy patterns of physical activity among

women, but no effects were observed amongst men, a finding that may have been influenced by the higher baseline physical activity participation among males than among females (Sallis et al., 1999).

Summary

It would appear that school-based physical education interventions can produce both physiological and behavioural physical activity outcomes. Few studies have supported health education, as a sole intervention, as an effective approach for increasing physical activity levels. However, the evidence supports modifications to the curricula to significantly reduce sedentariness during physical education classes and increase total time spent in moderate-vigorous activities (USDHHS, 1996). Classroom-based curricula on vigorous aerobic activities have demonstrated improvements in fitness and cardiovascular risk factors (Sallis et al., 1992). Aspects shown to positively influence the effectiveness of school-based programs include:

- Commitment of curriculum time devoted to physical education lessons;
- Use of physical education specialists to implement programs;
- Use of classroom teachers who have been appropriately trained in the delivery of physical education classes.

The US Department of Health and Human Services (1996) suggest the need for multi-component school-based interventions to focus on the individual and the school environment, as a means to support and encourage young people to participate in physical activity. Sallis and colleagues (1997) highlight the importance of the environment in studies involving pre-school children, and results indicate that children report higher levels of physical activity when they are outdoors as opposed to inside.

Egger and colleagues (1999) report on several key factors that may contribute to successful school-based interventions including:

- The development of policies requiring the implementation of curricula and instructional programs that meet the needs and interest of all students (including minority groups);
- Use of physical education specialists and trained school teachers. The provision of training should involve knowledge and skills that are needed to effectively promote enjoyment of lifelong physical activity among young people;
- Provision of safe spaces and facilities for physical activity in schools, including preventable measures taken toward physical activity-related injury and illness, and access to physical activity facilities between the hours of 11am-3pm to reduce sun exposure;
- Provision of out-of-school physical activity programs, including non-competitive activities to comply with the needs and interest of all students;
- Parental and community involvement.

4.4 CONCLUSIONS

A small number of international studies (mainly in America) have employed relatively new approaches in environmental and policy changes to promote physical activity in a range of settings. As these are long-term strategies, there is, as yet, insufficient evidence of the effectiveness of these approaches in reaching large sections of the population and in achieving lasting behaviour change. However, as argued in the conclusions section in Chapter 3, this type of strategy has greater potential to reach larger portions of the community than individual approaches, and also to support sustained behaviour change. Evidence shows that behaviour modification is the most effective method for achieving initial behaviour change in individuals. It has been argued that without supportive environments (e.g., physical activity facilities, accessibility, etc) it is less likely that physical activity behaviour will be maintained (Sallis & Owen, 1999)., Thus, modification of individual behaviour is most likely an important strategy to use in combination with environmental and policy approaches. The effectiveness of the delivery of individual approaches, such as using computer-mediated systems, still needs to be established.

This chapter also reviewed evidence of the effectiveness of international physical activity mass media campaigns. Findings from these international campaigns are consistent with Australian outcomes, and are associated with high awareness (generally around 70% for a televised campaign), increased knowledge, and more positive attitudes to physical activity. Some campaigns resulted in small increases in the population prevalence of physical activity, and also reported increases in individual participation, however, these were generally not sustained for more than a year. Mass media campaigns are most likely to achieve changes in motivational readiness for physical activity. Therefore, they should be more effective targeting those segments of the population who are in the precontemplation or contemplation stage of change for physical activity (as described in the Transtheoretical Model, Chapter 2).

International interventions in the community, workplace, and educational settings for promoting physical activity were also reviewed in this chapter. Large-scale community interventions in America (e.g., the *Stanford Five-City Project*, and the *Minnesota Heart Health Program*) have generally achieved only modest increases in physical activity within these communities. However these projects have mainly utilised mass media, combined with individual approaches, to effect behaviour change. Environmental and policy approaches have not been effectively employed within community settings. This framework combined with mass media and individual behaviour change approaches may be the most effective means for increasing adoption and maintenance of physical activity. As shown in Chapters 3 and 4, interventions focused on special sub-groups (e.g., older adults, ethnic minority groups) within communities have also achieved greater success compared to those with a broader focal point.

The key theme throughout this report, supported by evidence from international and Australian studies promoting physical activity, is that multi-level, multi-strategy approaches that emphasise combined environmental, policy and individual approaches are likely to be the most effective in developing and sustaining behaviour change. Evidence also provided in this chapter shows that different approaches may be more effective for different sub-groups. Further, individual differences within these sub-groups may require tailored approaches.

CHAPTER FIVE: INDIVIDUAL AND GROUP DIFFERENCES THAT INFLUENCE THE DELIVERY OF PHYSICAL ACTIVITY INTERVENTIONS

OVERVIEW

As described in the previous chapter, there is evidence that physical activity interventions may be more successful when tailored to match group and individual differences. This chapter will briefly review the evidence for differences in physical activity characteristics by sub-groups. Differences by socioeconomic status, age group, sex, ethnic and minority groups, and by rural and urban populations shall be explored.

5.1 SOCIO-ECONOMIC STATUS

Society's influences on physical activity are multifactorial (USDHHS, 1996). Some of these factors involve differences in social class, such as employment and poverty status. Adults from low socio-economic backgrounds and occupations (e.g. machinery operators) are at an increased risk of premature cardiovascular diseases, with physical inactivity being a major contributing factor (Salmon et al., 2000). However, few studies have examined physical inactivity according to multiple levels of social class in national representative samples of the population.

The Third National Health and Nutrition Examination Survey in America (1988-1994) found that physical inactivity during leisure-time is strongly associated with social class (Crespo et al., 1999). In particular, women were more physically inactive than men across every social class. This suggests that women, especially those from low SES backgrounds, are an important sub-group to be targeted by physical activity interventions.

Workers of lower occupational status (for example, labourers, machine operators) have been identified as being at an increased risk for CVD (Taylor, Baranowski & Young, 1998). Salmon and colleagues (2000) recently examined self-reported leisure-time and combined occupational/home physical activity for males and females in four occupational categories: less-skilled workers, skilled workers, professionals and homemakers. Less-skilled workers were less likely to report any kind of leisure-time activity. Further, those in low status occupations and homemakers were less likely to report participation in vigorous leisure-time physical activity sufficient for health and cardiorespiratory fitness. Taking into consideration the time spent in combined vigorous occupational/home physical activity, there was no longer an association of activity with occupational status for males, however the association remained in females (Salmon et al., 2000). Future physical activity promotional strategies targeting individuals in lower status occupations should take into account their occupational and home based activity levels, as this may contribute substantially to total daily physical activity levels.

Influences that favour the development of physical activity patterns amongst higher SES groups include greater education, increased knowledge of the health benefits of physical activity, stronger social norms of active leisure, better access to transportation, and an environment that offers greater acceptance to physical activity to those of a high SES status (Dishman, 1998). Hence, future research is required to better understand the effect that social class and environmental factors have on sedentary behaviours in society. The extent to which men and women of different social classes differ in their pattern of physical inactivity is not yet fully understood. This may be partly explained by the different gender roles assumed in the family and at work (Crespo et al., 1999).

5.2 OLDER ADULTS

Analyses of Australian population data on physical activity participation have found that people aged 55 years and over are 4.35 times more likely to be sedentary in their leisure time than those aged 25 years or less (Owen & Bauman, 1992). They were also significantly less active than those in all younger age groups. Two inter-related health benefits of regular physical activity participation are presented in the position statement Exercise and Physical Activity for Older Adults (ACSM, 1998). One is reduction in disease risk factors, and the other is a slowing in the rate of functional decline associated with ageing. The increasing importance allocated to maintenance of function is reflected in the recommendation that both aerobic and strength exercise are important for older adults.

The maintenance of physical function in the tasks of daily living becomes increasingly difficult as old age is approached (Cunningham et al., 1993; Spirduso, 1995). Accidental falls are the most dramatic exemplar of loss of function, leading to death, injury and high health costs. While there is general agreement that the aetiology of falls is multifactorial, significant relationships between falls and exercise levels have been found (Campbell et al., 1989; Nevitt et al., 1989; Lord et al., 1993). Physically active persons are significantly stronger, more flexible, and have higher cardiovascular fitness than inactive age matched peers (Brookes & Faulkner, 1994; Cunningham, 1993; Huang et al., 1998). By engaging in regular exercise the rate of functional loss is reduced and independence is maintained for longer (Pate et al., 1995; Spirduso, 1995). At the same time disease risk is reduced and individual quality of life is improved. For example, physical activity increases well-being; enhances self-esteem; improves self-efficacy; reduces the risk of anxiety and depression (Shephard, 1997).

Women are particularly vulnerable to functional loss, experiencing it earlier than men and more severely (Jette & Branch, 1981; Huang et al., 1998). Estimates are that only 57% of women aged over 55 exercise regularly (ABS, 1996). Late middle aged women, in whom functional loss can be relatively easily reversed, are a productive target for physical activity interventions aimed at reducing functional loss, and, in the process, disease risk. In research conducted at Deakin University (Jones & LeRossignol, 1995) a major benefit of a three month physical activity intervention with low active 55-65 year old women was self-reported regaining of lost physical function. Examples of regained function included the ability to dress while standing (rather than

sitting); to use a bath (rather than shower only) and to reach previously inaccessible kitchen shelves.

5.3 MIDDLE AGE ADULTS

As described in Chapter 1, approximately 12% of Australian adults are physically inactive, with almost half not sufficiently active for health benefits (Smith et al., 1999; Bauman et al., 1997). Although population surveys show declines in physical activity from young adulthood through to older adulthood, this decline is not linear. Epidemiological studies have shown that young adults (up to the age of 30 years) are the least likely to be inactive. Declines in activity continue through to “retirement-age” (about 55 years) with those immediately post retirement age often reporting higher amounts of activity until 65 to 70 years when the decline once more continues (Caspersen et al., 1994; USDHHS, 1996; Bauman et al., 1996). This consistent pattern of decline from ages 30 to 55 provides evidence of a “middle-aged slump” in physical activity behaviour. During this middle age period of the life-span, most adults have numerous time commitments such as increased family demands and work responsibilities.

A study that assessed patterns of perceived physical and psychosocial change in middle age found that midlife is associated with “many responsibilities, increased stress in several different domains, and little time for leisure. At the same time it is seen as the peak period for competence, ability to handle stress, sense of control, purpose in life, productivity, social responsibility, and other agentic qualities” (Lachman, Lewkowicz, Marcus, & Peng, 1994; pp.209). The successful promotion of physical activity in this sub-group may be one that takes into account factors such as family. For instance, physical activity programs that include the whole family may be more attractive and viable for this age group than individual behaviour change programs that place extra time burdens on participants.

5.4 YOUNG ADULTS

The transition from adolescence to adulthood is associated with changes in lifestyle behaviours that may increase the risk of cardiovascular and other chronic diseases later in life, including cigarette smoking (Weschler, Rigotti, Gledhill-Hoyt & Lee, 1998), increased alcohol consumption (Jones-Web et al., 1997), and poor dietary practices (Georgiou et al., 1997). Little is known about the determinants of physical activity specific to this group (King et al., 1992). An improved understanding of the determinants of physical activity as individuals enter adulthood is required, for the development of strategies to influence the physical activity behaviours of this group. The few studies conducted to date have typically focused on the influence of personal attributes such as knowledge, attitudes and beliefs towards physical activity (King et al., 1992). Although these factors account for physical activity behaviour to some degree, alone they are inadequate to fully explain physical activity participation and maintenance.

Population surveys from Australia and other industrialized countries show declines in physical activity through young adulthood and beyond (Bauman, Owen & Rushworth, 1990; Owen & Bauman, 1992). In pooled Australian population data, the reported prevalence of ‘sedentariness’

was 14% for those aged less than 25 years and 24% for those aged 25-39 years (Owen & Bauman, 1992). There are declines in physical activity in the teenage and young adult years. Although the decline in physical activity amongst young adults has been well documented, the reasons for the decline remain largely unexplored.

One possible explanation for this decline is that it is due in part to a displacement of these activities by more sedentary behaviours, such as computer use and television viewing (Fotheringham, Wonnacott & Owen, in press). In industrialized nations, computers play an increasing role in young people's day-to-day activities. The decline in physical activity during the young adult years may result in significant long-term implications on the health of the population, as there is some evidence to suggest that sedentary behaviours developed during young adulthood may track into adult life (Raitakari et al., 1994).

One study used Sallis & Hovell's (1990) Social Learning Model to examine physical activity determinants (including personal factors, and social and physical environmental factors) in a group of tertiary students (Leslie, Owen, Salmon et al., 1999). Significant differences were observed in the characteristics of sufficiently and insufficiently active students. Those who had high enjoyment of activity, high social support and high self-efficacy were more likely to be sufficiently active. These findings suggest that personal and social environmental factors can influence physical activity participation, and support the use of broader ecological models in physical activity determinants research.

5.5 CHILDREN AND ADOLESCENTS

Children are an important target group within the public health domain, because many of the causes of adult morbidity and mortality have their origins in childhood. Coronary heart disease risk factors (blood lipid levels, diabetes, blood pressure, smoking, obesity and physical inactivity) can develop during childhood largely as a result of lifestyle habits (Rowland, 1990). A New York study *Know Your Body* examined over 3000 children (aged 11-14 years), and found that 18% of children exhibited elevated serum cholesterol, 16% were obese, and 8% smoked (Williams, 1994). Evidence from previous studies has indicated that these risk factors not only have their origins in childhood but also track through to adulthood (Lauer, Lee & Clarke, 1988; Toda & Okuni, 1987; Wattigney, Webber, Srinivasan & Berenson, 1995; Webber, Srinivasan & Berenson, 1985).

In addition to psychological and biological benefits of physical activity in children, social benefits have also been found (Taylor & Sallis, 1997). Socialization of children through sport and physical activity has been shown to be important, however, differences exist between boys and girls (Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucett, et al., 1992). The International Consensus Conference on Physical Activity Guidelines for Adolescents recommended two guidelines for adolescents (aged 11- 21 years):

Guideline 1: All adolescents should be physically active daily, or nearly every day as part of play, games, sports, work, transportation, recreation, physical education, or planned exercise, in the context of family, school, and community activities.

Guideline 2: Adolescents should engage in three or more sessions per week of activities that last 20 minutes or more at a time and that require moderate to vigorous levels of exertion (Sallis & Patrick, 1994).

There are several important differences between adult and children's physical activity behaviour that makes the use of adult physical activity recommendations inappropriate for children. For example, adult activity is highly structured and organised. In contrast younger children tend to play to meet their activity needs. Adults have little free time compared to children, therefore, high intensity activities allow adults to decrease the length of the sessions. As children have fewer time restrictions they are able to accumulate a greater volume of sporadic activity throughout the day (Pangrazi, 2000). Pangrazi (2000) recommend that children should accumulate a total of 30 to 60 minutes moderate-intensity activity each day. This author also reported that children are often resistant to high-intensity activity. Finally, even though children's heart rates are elevated considerably throughout the day, these heart rates are often not sustained. Therefore, if children's activity levels are compared to guidelines for adults, the majority of children would be identified as inactive.

Lifestyle activities to be encouraged by parents, teachers and community groups are those activities that students are more likely to participate in outside of school and during adulthood (for example, jogging, walking, hiking or cycling). In the 1970's Glasser proposed five criteria for lifestyle activities:

- The activity is noncompetitive; the student chooses and wants to do it
- Participation does not require a great deal of mental effort
- The activity can be done alone, without a partner or teammates
- Students perceive some personal value in doing the activity
- The activity is accomplished without involving self-criticism (cited in Pangrazi et al., 1997)

We currently know very little about the physical activity behaviours of Australian children. Only one study to date (Booth, Macaskill, McLellan, Phongsavan, Oakley & Patterson et al., 1997) has provided any information about the physical activity behaviour of youth under the age of 16 years. The study was conducted in NSW and examined adolescents in years 8 & 10. Findings revealed that 69% of boys and 61% of girls were vigorously active during summer school terms. During the winter season however, girls' participation in vigorous activities declined to 46%, while in males it remained at 67%. Booth and colleagues (1997) suggested that this could reflect a greater availability of, and emphasis on traditional male winter sports. More recently however, McKenzie and colleagues (2000) reported that few students use opportunities to be physically active during leisure-time at school and boys were more likely than girls to engage in more

moderate to vigorous physical activity, before school and at lunch-time (McKenzie et al., 2000). To date, there has been no research (to date) in Australia on the physical activity levels of children younger than 12 years. Other studies have examined the daily patterns of pedestrian activity in young children (Carlin et al., 1997), as well as the economic impact on families of children's participation in junior sport (Kirk et al., 1997). Table 5.1 identifies useful strategies for the promotion of physical activity among children and youth that may be applied for future interventions targeting these populations.

5.6 WOMEN

Despite the benefits of regular physical activity, rates of adoption and adherence for women are low in westernized countries. Women of all ages are considerably less likely than men to engage in physical activity (Stephens & Craig, 1990; USDHHS, 1996). Women also show a higher prevalence of inactivity with age in Australia (Women's Health Australia, 1997). Cross sectional data from the last decade indicates that the decrease in physical activity participation by Australian women commences at age ten, increases with motherhood responsibilities and then worsens, depending on the number of young children within the family (Bauman et al., 1996; Women's Health Australia, 1997). In addition, women with sole child-care duties and those who are not employed have been identified as being the least active (Women's Health Australia, 1997). Hence, women are an important sub-group to be targeted for physical activity intervention.

Women are more likely to participate in low levels of physical activity and therefore, are more likely to be classified as 'inadequately' active in reference to current Australian physical activity guidelines. Although women report walking more than men, they are less inclined to undertake vigorous exercise (Corti, 1997). Hence, an emphasis on increasing moderate-intensity aerobic activity for women would be beneficial. There is evidence to suggest that social support and physical activity (i.e. exercising with others) may be more influential for women, compared to men. For example, Sallis and colleagues (1992) reported that amongst those individuals who were sedentary at baseline, the adoption of physical activity at follow-up was significantly predicted by social support for women. These findings have been further supported by Duncan and colleagues (1993) who reported on a study of adults participating in an exercise program. Findings indicated that social support predicted attendance, and this was reported for women only. Other factors that have been implicated for influencing women's participation include personal control and regular participation in organisations/groups (Felton & Parsons, 1994).

Table 5.1: Strategies for the promotion of physical activity among children and youth

Setting	Objective	Strategies
Home	<ul style="list-style-type: none"> • Presence of physically active role model • Joint parent-child physical activity participation • Parent facilitation of child activity • Limit TV viewing 	<ul style="list-style-type: none"> • Parents are physically active at home in presence of children • Parent-child are physically active after school and on weekends • Parents supervise activity, and if needed, transport children to activity settings and programs • Parents restrict TV viewing, especially at times when physical activity is an option
Schools	<ul style="list-style-type: none"> • Provision of adequate time devoted to physical activity • Promotion of lifelong physical activity • Promotion of motor skill acquisition • Promotion of physical activity via after school programming • Presence of physically active teacher role models 	<ul style="list-style-type: none"> • Physical activity time in Physical Education classes and during other times is maximised • Physical Education provides enjoyable exposure to developmentally appropriate physical activities • Physical Education provides basic mastery of motor skills applicable to lifetime fitness • School provides after school activity programs that meets the needs and priorities of students • School provides employee Health Promotion program and supports on site teacher/staff participation in physical activity
Community	<ul style="list-style-type: none"> • Provision of physical activity programs for children and youth • Provision of safe and attractive physical activity facilities 	<ul style="list-style-type: none"> • Community recreation programs and private youth organisations offer and promote a variety of Physical Activity programs, including those which are non-competitive • Communities provide playgrounds, parks, pools, gymnasiums, bike/jogging tracks that are safe, accessible and attractive

(Source: Cheung & Richmond, 1995)

King (1991) has developed a table that identifies features and examples of physical activity programs for several developmental milestones relevant to women (Table 5.2). This is particularly relevant, as levels of physical activity in women decline with age and hence, the goals and strategies listed in the table are useful recommendations towards future physical activity initiatives for women.

In conclusion, there is a need to continue developing better measures to assess mild-moderate intensity physical activity in women. This may help to reduce the gap of participation levels of physical activity between men and women. Further, barriers for participation in physical activity for women needs to be identified, particularly in light of young mothers and older women, who demonstrate marked declines in physical activity at this time.

5.7 ETHNIC SUB-POPULATIONS

Low income, ethnic minorities, and populations with disabilities are more likely to have chronic diseases related to sedentary lifestyles compared to other populations (USDHHS, 1996). Findings from the 1994 NSW Health Department Survey found that having a non-English speaking backgrounds (NESB) was a major factor associated with inactivity. More specifically, 59% of people surveyed from culturally diverse backgrounds were shown to be 'inadequately active,' in comparison to 49% of the general population (Bauman et al., 1996).

According to the Australian Institute of Health & Welfare (AIHW, 1998) Australians born overseas have a lower prevalence of major causes of death, including those with inactivity as a casual factor, and generally reduced levels of morbidity. However, as the duration of residency increases, morbidity and mortality rates have shown a tendency to approach those of Australian-born individuals (AIHW, 1998).

There have been numerous community and workplace intervention trials that have included proportions of minority groups, however few have examined the impact of these interventions (Sallis & Owen, 1999). To date, interventions have produced mixed results as these types of programs often fail due to cultural and language barriers (Brown & Lee, 1994; USDHHS, 1996).

Recent international studies have provided an insight into the future directions of physical activity interventions targeting ethnic and minority populations. For example, Crespo et al (1999) reported on the prevalence of physical inactivity amongst minority groups, based on findings from The Third National Health & Nutrition Examination Survey, conducted in the USA. Inactivity was found to be more prevalent amongst societal classes that are less educated, living below the poverty line, living in households earning under US\$20,000 per year, and who are retired (Crespo et al., 1999). Findings reported by Ainsworth and colleagues (1999) revealed that less than 25% of African American and Native American women reported engaging in conditioning and sports activities for physical activity. Walking for exercise, household chores, childcare,

lawn and garden activities were the main preferences for physical activity reported by the sample.

Table 5.2: Examples of physical activity programs for developmental milestones relevant to women

Milestone	Specific Features	Goals and Strategies
Adolescence	<ul style="list-style-type: none"> • Rapid physical/emotional development • Increased concern regarding appearance and weight • Issues of independence • Increased peer influence • Short-term perspective 	Physical activity included in a program emphasising weight regulation, fun and varied activities that are non-competitive, emphasis on independence and choice, focus on outcomes including stress management and body image, peer support and participation
Initial work entry	<ul style="list-style-type: none"> • More demands placed on time and scheduling constraints • Employer demands • Short-term perspective 	Choice of activities that are enjoyable and convenient, focus on proximal outcomes (as listed above), involvement of the workplace, injury prevention, goal setting, non-competitive activities involving co-educational participation
Parenting	<ul style="list-style-type: none"> • Further family demands and time restrictions • Family focus • Post-birth effects on mood and weight 	Emphasis on benefits to family and self (including stress management, well-being & weight control), activities appropriate to children, personalised regime that is flexible and convenient, incorporating activities on a daily basis, involvement of neighbourhood, goal setting (family based) and availability to child-care services
Retirement	<ul style="list-style-type: none"> • Increased time availability and flexibility • Care giving duties • Responsibilities (parents, children, grandchildren) • Long-term health perspective & 	Identification of former and current enjoyable activities, matching activities to health status, emphasis on regular participation in physical activity on a daily basis that involves mild- and moderate intensity activities, emphasis on activities supporting independence, gaining support from family and friends, availability of required services (including care taking

	increased health concerns	facilities for partner)
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(Source: King (1991) as cited in Dishman, 1998)

Further, Gorden-Larsen (1999) found that adolescents (with the exception of Asian women) demonstrate consistently higher levels of physical inactivity in the USA. Future interventions should focus on increasing physical activity amongst adolescents, as well as minority sub-populations.

Brown and colleagues (1996) reported that programs tailored specifically for groups of women from NESB (who reside in Australia) can be effective in modifying cardiovascular risk factors, if an attempt is made to address linguistic and sociocultural barriers to participation. Another Australian study found that women from NESB have poorer cardiovascular health compared to other Australian women, and are less likely to exercise (Lee & Brown, 1998). Women from NESB are also likely to benefit from social support. Conclusions drawn from this study support the need for a selection of activities, and the provision of programs in community languages, as important considerations for the recruitment of migrant women for health promotion and community interventions.

Increasing physical activity amongst ethnic and minority populations is an important public health challenge. Definitions used to characterise regular physical activity should be consistent among studies, and further, physical activity surveys among women need to include measures of occupation-related and home-based activities. The assessment of occupation and household physical activity (in addition to leisure-time physical activity) may be important for understanding the association between occupational categories, physical activity and levels of health risk for the development of physical activity strategies (Salmon et al., 2000). Increasing physical activity levels within ethnic and minority populations shows potential and promise for reducing health care costs and improving quality of life and hence, a substantial public health impact is achievable.

5.8 RURAL POPULATIONS

Adults living in rural communities have been found to have poorer health profiles compared to those living in metropolitan regions (Commonwealth Department of Human Services & Health: (CDHSH, 1994). Men and women in rural areas have been shown to be 10% and 16% more likely to die from coronary heart disease (CHD) respectively, compared to those living in metropolitan areas of Australia (Commonwealth Department of Human Services & Health, 1994). Rural dwellers have also been shown to have higher incidences of skin cancer, alcohol and tobacco consumption. There is also greater exposure to hazards such as farm machinery, leading to increased risk of injury.

In relation to lifestyle risk factors such as overweight and obesity, greater proportions of adults in rural communities have been found to be overweight or obese (Crawford & Owen, 1994; Crawford, Owen, Broom, Worcester & Oliver, 1998). Descriptive data available on the

prevalence of physical activity in rural versus urban populations in NSW shows that 15% of rural adults are physically inactive compared to 12% of adults living in urban communities (Bauman et al., 1996). In considering the higher incidence of lifestyle diseases, such as CHD and obesity in rural populations and the recognised associations with inactivity, it is important to develop a better understanding of physical activity characteristics in this important sub-group.

There is a need to continue monitoring the prevalence of physical activity in rural Victoria, including the different domains of physical activity most relevant to rural populations (e.g., work-related physical activity). Further, it is important to better understand the influences on physical activity for those living in rural communities, as there may be unique factors that determine physical activity in this sub-group.

5.9 INDIGENOUS POPULATIONS

Indigenous populations are a particularly important sub-group to target for physical activity intervention, because they are disadvantaged by their poor health and nutritional status. In general, indigenous people in Australia are younger than the general population, leave school earlier, are more likely to be unemployed, and have relatively high birth and infant mortality rates (Lester, 1994). Further, these sub-populations show a greater tendency for the development of cardiovascular diseases (CVD), non-insulin dependent diabetes mellitus (NIDDM) and circulatory diseases.

Indigenous people are more likely than other Australians to be overweight and/or obese and are twice as likely to smoke, placing them at a greater risk of developing associated health problems including lung cancer and CVD. Despite indigenous people drinking less alcohol compared to other Australians, those who do drink are more likely to do so at unsafe levels (AIHW, 1998).

Body fat accumulation, physical inactivity, excess energy intake and high fat diets are aspects of the Western lifestyle that have been implicated in the development of NIDDM in indigenous populations (O'Dea, 1991). Weight reduction, regular physical activity and low fat/high fibre diets have been shown to improve insulin action (O'Dea et al, 1989). When diet and physical activity levels are modified towards the traditional hunter-gatherer lifestyle, the metabolic abnormalities associated with diabetes and impaired glucose tolerance are significantly reduced (O'Dea, 1984). The traditional lifestyle can act as a model whereby interventions based on regular physical activity, low energy density diets and obtaining a lean body weight can be developed. In order for interventions aimed at indigenous populations to be successful in the long-term, they must be developed and implemented by indigenous communities, to ensure they are culturally appropriate (O'Dea, 1991). Indigenous people do not constitute a homogenous group, rather, within this population are sub-groups containing different lifestyles and profiles. Hence, collection of data from this group, and future health and physical activity interventions must take this heterogeneity into consideration (AIHW, 1998).

There have been few studies examining the effects of health interventions on indigenous populations and, to date, little is known about the patterns and determinants of physical activity

in these sub-populations. However, one recent study examining sport participation in indigenous males in the Northern Territory found a high incidence of cardiac death (attributed to underlying ischaemic heart disease) amongst young Australian rules footballers (Young et al., 1999). Further, little is known in respect to physical activity and cultural factors, attitudes and beliefs towards physical activity.

5.10 CONCLUSIONS

This chapter explores evidence of differences in physical activity participation for different sub-groups. Differences in physical activity by age group, sex, socioeconomic status, ethnicity and for those living in rural and regional centers were described. Many of the sub-groups that have low levels of physical activity also have poorer health profiles generally. For example, although there is not a great deal of descriptive data available on levels of physical activity in rural populations in Victoria, higher levels of CHD and obesity in these communities suggest that promoting physical activity in this sub-group would be an important preventive strategy.

One of the enticing features of the recent National physical activity guidelines is the broader appeal that these recommendations have to many of these sub-groups. The greatest public health gains will result from increases in physical activity amongst those who are inactive. Promoting an activity message that encourages increased movement and overall energy expenditure provides a new challenge for public health practitioners. It is hoped that this 'new' message will be more achievable for greater proportions of the population.

CHAPTER SIX: LINKS BETWEEN PHYSICAL ACTIVITY AND OTHER HEALTH PRIORITIES

OVERVIEW

Physical activity is one of the key health priority areas identified by VicHealth in its 3-year strategic plan (VicHealth, 1999). Other key health priority areas are healthy eating, mental health, alcohol, and smoking. There is some overlap between physical activity and other health behaviours. For example, interventions that target physical activity and healthy eating have been found to be successful in weight control programs, not just in achieving weight change or maintenance, but also increased program adherence (Wilfley & Brownell, 1994). The evidence of links between physical activity, the VicHealth priority areas, and other health issues will be considered in this chapter. As Dishman argues, “much more must be learned about combining physical activity interventions with interventions designed to alter other health-related behaviours” (1994; pp.22).

6.1 HEALTHY EATING

The evidence linking diet with chronic and preventable diseases is acknowledged in Australia and internationally to provide sufficient reason for including improved nutrition as a major component of public health initiatives (Lester, 1994). To date, the evidence appropriately defines a strong association between diet and numerous chronic diseases found in modern, technologically advanced countries. The major causes of morbidity, mortality and disability in Australia that are thought to have a nutrition component in their aetiology include coronary heart disease, stroke, hypertension, some forms of cancer, non-insulin dependent diabetes mellitus (NIDDM), osteoporosis and gall bladder disease.

The ‘Dietary Guidelines for Australians’ (NHMRC, 1997) were established to provide advice to the general population about healthy food choices, so that their typical diet contributes to a healthy lifestyle and is consistent with minimal risk for the development of diet-related diseases. They represent the best consensus of scientific knowledge and public health advice currently available. The Dietary Guidelines for Australians includes maintaining a healthy body weight by balancing physical activity and food intake.

The NHMRC (1997) reported on the role of physical activity in nutrition and health, and noted that inactivity was a health and nutrition risk and that exercise had positive and beneficial effects (US Department of Health and Human Services, 1996). For example, regular exercise can help control blood lipid abnormalities, diabetes and obesity. Bauman and Owen (1991) reported significant independent associations between levels of physical activity participation and HDL cholesterol levels, the HDL-to-total cholesterol ratio, and serum triglyceride levels shown for both men and women. Further, exercise is also associated with increased mineral content of bones, and a decline in physical activity may increase the prevalence of osteoporosis (Bauman &

Owen, 1991). Associations between physical activity and healthy eating have been assessed, particularly in studies of weight loss and weight control (Grilo, 1995). In addition, physical activity and diet have also been studied in relation to clustering of unhealthy behaviours.

Studies of young adults have found associations between physical inactivity and dietary fat intake, and a clustering with other unhealthy behaviours (e.g., excessive alcohol use) affecting risk for lifestyle diseases among this age group (Aaron, Dearwater, Anderson, Olsen, Kriska & Laporte, 1995; Burke, Milligan, Beilin, Dunbar, Spencer, Balde et al., 1997; Raitkari, Leino, Raikkonen, Porkka, Taimela, Rasanen et al., 1995; Steptoe, Wardle, Fuller, Holte, Justo, Sanderman et al., 1997). Reviews have found high quality dietary habits to be positively associated with physical activity (Sallis & Owen, 1999; Wankel & Sefton, 1994;), and dietary fat intake has been found to be inversely associated with physical activity (Simoes, Byers, Coates, Serdula & Mokdad, 1995).

Although the clustering of unhealthy behaviours in young adults has been well documented (Donovan, Jessor & Costa, 1988; Johnson, Nichols, Sallis, Calfas & Hovell, 1998), there is less evidence of clustering in middle and older age adults. There is a lack of evidence to explain potential mechanisms underlying the clustering of unhealthy behaviours. It is not known whether clustering, when it does occur, is a reflection of personality type or syndrome (Donovan et al., 1988), environmental influences (e.g., family and social), or even some underlying physiological mechanism (Stephens, 1990). Nonetheless, the linking of healthy eating with physical activity initiatives is one that seems to have strong face validity and would have several physiological outcomes in common (for example, obesity, blood lipids, bone density).

6.2 OVERWEIGHT/OBESITY

Overweight and obesity are associated with an increased risk of morbidity and/or mortality from a number of chronic diseases including non-insulin-dependent diabetes, coronary heart disease, hypertension, osteoarthritis and certain cancers (WHO, 1997). In Australia, the economic cost of obesity has been estimated conservatively at \$860 million per annum, with a further \$500 million spent by consumers each year on weight loss programs (NHMRC, 1997). The prevalence of overweight and obesity is increasing in western countries. According to the 1995 National Nutrition Survey, almost one in five adult Australians are obese ($BMI > 30 \text{ kg/m}^2$), and a further 45% of men and 29% of women are overweight ($25\text{-}30 \text{ kg/m}^2$) (ABS, 1995). The prevention of weight gain and the reduction in the prevalence of overweight and obesity are thus important national public health goals in many industrialized countries including Australia.

The rapidly increasing prevalence of obesity in western nations is believed to be the product of key socio-cultural, rather than genetic factors. The adoption of a sedentary lifestyle, and the high desirability and freely available nature of a diet high in energy and fat, are thought to combine to increase the risk of obesity. Declining physical activity, particularly incidental activity, is arguably the most important contributor (WHO, 1997). A review of evidence suggested that

higher levels of physical activity are associated cross-sectionally with lower body weight and more favourable patterns of body fat distribution (DiPietro, 1995). Increasing physical activity is therefore viewed as a critical component of attempts to control weight (Garrow & Summerbell, 1995; Grilo, 1995; WHO, 1997). Physical activity has been shown to complement dietary restriction or changes in diet composition undertaken for weight reduction (Hill et al., 1989; Pavlou, Krey & Steffee, 1989). Importantly, physical activity aids in the preservation of lean body tissue usually lost during dietary restriction, while the additional elevation of energy expenditure further enhances negative energy balance (Garrow & Summerbell, 1995). Although weight loss attributable to increased physical activity may be small, physical activity has been repeatedly shown to play an important role in the maintenance of weight loss (Hill et al., 1989). In addition, there is evidence to suggest that physical activity is important in preventing weight gain over time (Saris, 1998).

A vast number of studies report weight loss intervention programs for the overweight. These have involved various approaches and settings, including community-based, workplace-based, and interventions by correspondence (ie. those interventions delivered through the mail). Interventions have focused on effecting either dietary change, increased physical activity, or both. To date, however, these interventions have been largely ineffective in the long-term, with weight regain frequently reported (Glenny et al., 1997). In addition, although there is an extensive body of research which has examined the effectiveness of weight reduction programs, there is, in fact, little published research which has specifically addressed the issue of weight gain prevention (Forster et al., 1988; Jeffery & French, 1999). Since the 1970s there have been a number of population-based intervention studies that have investigated the impact of a variety of public health measures (including physical activity) on reducing cardiovascular risk factors and which might be expected to have had an impact on weight. Overall, however, the results were disappointing, with the interventions having little or no effect, and average weights actually increasing in some of the intervention communities. These findings suggest that, in addition to encouraging individuals to take steps to control their weight, future efforts to prevent overweight and obesity should place a much greater emphasis on promoting and supporting changes to physical and social environments that will increase opportunities for people to participate in regular physical activity and to make healthy food choices.

6.3 MENTAL HEALTH

Mental health can be seen as the embodiment of social, emotional and spiritual well-being; it provides individuals with the vitality required for active living, to achieve goals and to interact with one another in ways that are respectful and just (VicHealth, 1999). The promotion of mental health and the prevention of mental illness is currently receiving international and national attention. The Mental Health Promotion and Prevention National Action Plan (Commonwealth Department of Aged & Health Care, 1999) was created in response to the high social and economic costs of mental health, as well as the rising incidence of depression. VicHealth's *Strategic Directions 1999-2002* identifies mental health as a priority area for investment in health

promotion endeavours, and provides a framework for mental health promotion and a proposed research and implementation agenda for the next 3 years.

The evidence linking mental health and physical activity has been documented. It has been suggested that exercise induced changes in brain neuroreceptor concentrations of monoamines (norepinephrine, dopamine or serotonin) or endogenous opiates (endorphins) may help to favourably alter mood and feelings of depression and anxiety (Moore, 1982; Ransford; 1982). DeVries (1981) reported that increased core body temperature (resulting from physical activity) may also reduce muscle tension. Other metabolic, hormonal, hypothalamic, or cardiorespiratory changes that result from physical activity may eventually be linked to mental health. Further, psychosocial aspects of physical activity (e.g. social interaction and support), experiencing increased feelings of self-mastery and self-efficacy, may enhance the mental health status in some people (USDHHS, 1996).

A solid body of research has identified linkages between:

- Exercise and reduced depression and anxiety (Landers & Petruzello, 1994; Martinsen & Stephens, 1994; O'Conner, Bryant, Veltri, Gebhardt, 1993)
- Exercise and stress response reduction (Rejeski, Thompson, Brubaker, Miller, 1992)
- Global psychological health and physical activity participation (Martinsen & Stephens, 1994; Moses, Steptoe, Mathews, Edwards, 1989; Stephens, 1988)
- Exercise and sleep quality (King, Oman, Brassington, Bliwise, Haskell, 1997; O'Conner & Youngstedt, 1995)
- Exercise and perceptions of self-esteem (McAuley, 1994; McAuley & Rudolf, 1995)
- Exercise and perceptions of quality of life (Stewart, Hays, Wells, Rogers, Spritzer, Greenfield, 1994)

A recent 8-year longitudinal study of more than 650 older age Finnish adults (65+ years) assessed depressive symptoms using a Finnish modified version of Beck's 13-item depression scale (Lampinen, Heikkinen & Ruoppila, 2000). It was found that those who had decreased their self-reported intensity of physical activity over the 8-year period also reported more depressive symptoms at follow-up. It was concluded that age-related declines in physical activity intensity may increase the risk of symptoms of depression in older age.

The promotion of physical activity as a treatment for non-clinical depression, for treatment of depressive symptoms, and as a preventive measure may be useful in 'healthy' populations. In addition, there is evidence that in clinical populations, the use of physical activity along with other treatments (pharmaceutical and non-pharmaceutical) may also be of benefit (Martinsen & Stephens, 1994).

Interventions that use physical activity as a treatment for mental illness have found that physical activity has not been successful in treating psychotic depression or melancholia, and few studies have assessed the effectiveness of physical activity in treating anxiety, panic disorder and agoraphobia (Martinsen & Stephens, 1994). However, studies have found a general decreased likelihood of depression in healthy adults, and when combined with other treatments may also be beneficial to clinical cases.

6.4 ALCOHOL

There are few studies that have investigated the links between alcohol consumption and physical activity participation. In a large study of European university students, Steptoe and colleagues (1997), reported inconsistent findings for the relationship between alcohol consumption and exercise participation. Females who participated in physical activity were less likely to consume alcohol than sedentary females, however this pattern was not observed amongst men. Shepard and Bouchard (1996) observed weak associations between alcohol consumption and physical activity participation in a sample of Quebecois adults. Conversely, reviews have found no association between alcohol use and physical activity (Blair et al., 1985; Wankel & Sefton, 1994; Sallis & Owen, 1999), and more recent studies are equivocal (Aaron et al., 1995; Raitkari et al., 1995; Steptoe et al., 1997). The association between physical activity participation and (excessive) alcohol consumption warrants investigation.

6.5 SMOKING

The health hazards of cigarette smoking are well established. Smoking has been linked to ischaemic heart disease, cancers, chronic obstructive pulmonary disease, stroke and a range of other diseases in adults and youths (e.g., US Surgeon General, 1994). There is some evidence that participation in physical activity is inversely related to smoking - those who smoke are less likely to participate in sufficient levels of physical activity to accrue long term health benefits compared to non-smokers.

A number of studies have identified associations between smoking and lack of physical activity. For example, Steptoe and colleagues (1997), in a large study of male and female European university students, reported that smoking was inversely associated with exercise participation. Similarly, Shepard and Bouchard (1996) observed weak associations between smoking and physical activity participation in a sample of Quebecois adults, while Lytle and colleagues (1995) reported that adolescents who smoked participated in less physical activity than non-smoking adolescents. Further, some longitudinal studies have reported increases in levels of physical activity participation in association with smoking cessation (e.g., Blair et al., 1986).

In an Australian study of the health behaviour of 18 year olds, Burke and colleagues (1997) reported that smoking was associated with non-participation in physical activity by young women. A higher proportion of young male smokers were inactive than young male nonsmokers, although this difference did not reach statistical significance.

The *Activity Counselling Trial* (ACT), a multicentre study in the United States, is evaluating the effectiveness of physical activity interventions in primary health care settings (Blair et al., 1998). As part of this trial, an examination of the role of smoking cessation in physical activity promotion is being performed - initial results suggest that smoking cessation and physical activity adoption are inter-related (Blair et al., 1998). There appears to be considerable scope for further research to explore the interaction between smoking and physical activity - physical activity may be a useful mechanism to assist in attempts to quit smoking, and smoking cessation may be a means of making physical activity more achievable for some segments of the population.

6.6 INJURY PREVENTION

Initiatives to promote physical activity will be more acceptable and successful if they have strong injury prevention principles as part of their foundations (Finch and Owen, 2000). Increased participation in physical activity, which includes participation in vigorous sports and fitness activities, implies potentially greater exposure to risk of injury (Finch and McGrath, 1997). In addition, having a safe physical activity environment in which to participate in such activity (e.g. in the workplace as discussed in Chapter 4) is also an important consideration.

The national injury prevention and control strategy recognises sport and physical activity injuries as a significant public health problem and as a major barrier to participation (Commonwealth Department of Human Services and Health, 1994). It also recognises that such injuries can interfere with the enjoyment of sport and physical activity and can limit the potential benefits of physical exertion. Actual injury and fear of injury can act as barriers to adopting a more-active lifestyle for some adults (Commonwealth Department of Human Services and Health, 1994). The national SportSafe framework complements the Active Australia participation framework by providing a basis for safe participation in all physical activity. The SportSafe program is now a key focus of the broad activities of the Participation (i.e. Active Australia) Division at the Australian Sports Commission.

Injury prevention principles are crucial to physical activity for a number of reasons:

- To ensure that the physical activity being undertaken does not, itself, constitute a high risk to participants (i.e. it is safe)
- To ensure that the physical environments in which physical activity is undertaken are safe.

A joint initiative of VicHealth, Sport and Recreation Victoria and Health and Community Services has recently established the SmartPlay program in Victoria. The aim of the SmartPlay program is to minimise the frequency and severity of injury associated with physical activity in the sport and recreation context. This initiative has the potential to contribute to other ongoing initiatives to promote physical activity in this State by addressing the above points.

Increasing sport and physical activity necessitates health and fitness professionals, as well as individuals, making a choice about the type, intensity and amount of appropriate exercise. Crucial to this decision is an understanding of the hazards of sport and physical activity (i.e. sport and physical activity injury risks), as well as the benefits. Recognition of the potential for injury is evident in habitually sedentary people suddenly engaging in vigorous activities and an increasing recognition of the potential injury-related costs of vigorous sporting activity (Australian Sports Commission, 1997).

A critical review of the relationship between exercise, training and injuries concluded that is important to have a better understanding of the impact of parameters of training and other factors associated with injury prevention and optimal outcomes from exercise (Jones, 1994). Furthermore, the key parameters of aerobic exercise for health/fitness (i.e. intensity, duration and frequency) all influence the risk of injury in proportion to the effect of the specific parameters on the total amount of exercise performed (Jones, 1994). The relevance of this conclusion is that promotion of vigorous exercise needs to be accompanied by explicit, evidence-based strategies to promote of safe participation.

Education of physical activity participants is an effective strategy for promoting safety (Finch and McGrath, 1997). For example, Egger and colleagues (1999) recommended the use of physical education specialists and trained school teachers in the school setting. This would provide school-based training to develop knowledge and skills that are needed to effectively promote enjoyment of lifelong physical activity among young people

Attention to the broader physical activity environment has been shown to be an important of physical activity promotion. Egger and colleagues (1999) argued for the provision of safe spaces and facilities for physical activity in schools, including preventable measures taken toward physical activity-related injury and illness. A study of environmental factors influencing active lifestyles in two country towns in New South Wales, identified safety of the physical environment as a potential major influence on physical activity participation (Hahn and Craythorn, 1994). Another study based in Perth found that a fear of dogs and personal safety were reported as deterrents to physical activity by participants in the community (Corti et al., 1996).

Actions to improve the safety of the physical environment include:

1. Separating participants from road traffic e.g. separate bike and walking paths
2. Banning or restricting the use of recreational vehicles such as in-line skates and skateboards in areas with high traffic and pedestrian flow
3. Road safety measures to improve pedestrian safety
4. Ensuring that facilities and buildings used for sport and other physical activities are regularly maintained and upgraded
5. Providing adequate lighting on walking tracks and stair cases

There is also another link between physical activity promotion and injury prevention. Some physical activity can actually prevent injuries too. The best example of how physical activity can help to prevent injuries is the use of exercise programs to prevent elderly falls. A meta analysis has concluded that treatments including exercise for elderly adults can reduce the risk of falls (Province 1995). A recent study from Sydney has concluded that adherence to an exercise program may reduce the number of falls in the elderly, however further studies are needed to effectively demonstrate this (Lord, 1995). Another study which randomised people aged 70+ years to three groups (Tai Chi, balance training, education) found a significant reduction in falls rate in the Tai Chi group (Wolf, Barnhart and Kutner., 1996). Additional, or varied physical activity, can also have a role in preventing injuries. Examples are cross-training programs to prevent overuse injuries; stretching and conditioning programs; pre-season training and specific get fit programs (Australian Sports Commission, 1997; Finch and McGrath, 1997; Saxon, Finch and Bass, 1999).

6.7 SEDENTARY BEHAVIOUR

As described in Chapter 1, sedentary behaviours can be identified by the low levels of energy used in performing them. With increased automation and opportunities for sedentariness in our daily lives, it is becoming progressively easier to be physically inactive. In Australia, time use data show that on average, adults spend almost two hours per day watching television and almost six hours per day in social and leisure activities (ABS, 1994). Recent data show that children and young adults watch approximately two-and-a-half hours of television per day, adults aged 25 years and over spend more than three hours per day watching television (Nielsen, 1999). In contrast, only 50% of the adult population in Australia report spending 30-minutes per day or more in moderate-intensity leisure-time physical activity at least five days per week (Bauman et al., 1996; Smith, 1999). Extended hours of television viewing, one of the most prevalent leisure-time sedentary behaviours, has also been found to be cross-sectionally and longitudinally associated with overweight and obesity in children (Dietz et al., 1985; Gortmaker et al., 1996), in adolescents and young adults (Sidney et al., 1996), and in adults (Ching et al., 1996; Tucker et al., 1986; Tucker et al., 1989).

A recent cross-sectional, population-based study of Australian adults found that those watching more than four hours television per day were two times more likely to be overweight, independent of physical activity level (Salmon et al., 2000). The important finding in this study was that physical activity did not seem to be protective against the impact on body weight of prolonged periods of sedentariness. Even those who were highly active in their leisure time, but who also reported watching more than four hours of television per day, were twice as likely to be overweight as were those who watched less than one hour of television per day. In young adults, computer use has been found to be inversely associated with participation in physical activity (Fotheringham, Wonnacott, et al., in press). In this cross-sectional study of university

students, high self-reported levels of computer use were associated with increased likelihood of physical inactivity.

The impact of high rates of habitual television viewing, computer and Internet use may be important to study in their own right. In particular, the association with physical activity is essential to understand, as studies to date indicate these sedentary behaviours may be more than just the 'flipside' to physical activity, and that there may be "scientific utility in differentiating physical activity and sedentary behavior" (Owen, Leslie, Salmon & Fotheringham, in press). Each may usefully be addressed as a problem for research and for public health action. For instance, it may be useful to gain a better understanding of common sedentary behaviours, such as prolonged periods of automobile travel, use of public transport, and selecting opportunities for incidental physical activity rather than the sedentary option.

6.8 CONCLUSIONS

The development of promotional strategies that target more than one health behaviour is an approach that has often been utilised in health promotion; particularly in areas like physical activity and nutrition that have health outcomes such as overweight and obesity in common. Evidence of links with other health areas such as mental health, smoking, alcohol, and sedentary behaviour is not as strong compared with the evidence of links between nutrition, physical inactivity, safety and obesity. However, increasing numbers of interventions and health promotion strategies are focusing on multiple lifestyle risk factors, particularly within contained settings such as the work environment. Where there are clear links across health behaviours, it would be useful to combine approaches and achieve more value for money and endeavour.

CHAPTER SEVEN: SUMMARY OF PHYSICAL ACTIVITY STRATEGIES

This chapter provides a synthesis of the evidence for the effectiveness of the range of potential approaches for promoting physical activity reviewed in this report. This evidence is used to provide broad recommendations for both population and individual approaches to physical activity promotion that take into account behaviour settings, group, and individual differences. As this report has demonstrated, there have been relatively few published studies that have evaluated the effectiveness of physical activity promotion strategies. Nevertheless, these strategies can be classified into one of the following groups:

1. Strategies with consistent evidence. Strategies that have been repeatedly shown to be effective in numerous studies, in different behaviour settings and in different population groups.
2. Strategies with potential. Approaches that have some demonstrated potential in the promotion of physical activity, with short-term success, in limited settings, and/or in certain subgroups.
3. Strategies to be further evaluated. Approaches that have not been assessed in the specific context of promotion of physical activity but have been effective with other health behaviours, or for which descriptive or cross-sectional data suggest further investigation could be warranted.
4. Strategies to be developed. The development of new strategies or combinations of approaches to promote physical activity.

Chapters two to four describe the various population approaches that have been applied to the promotion of physical activity in Australia and internationally. A summary of environmental, policy, and mass media approaches is presented in this section.

In Australia, the past seven years have seen the development of several physical activity policy statements, more so in the last three years after the release of the US Surgeon General's Report on Physical Activity (USDHHS, 1996). Although many of these policies have been developed to increase general levels of physical activity in the Australian population, there is currently insufficient evidence that these policies are achieving their objectives. The strongest evidence using these population approaches would be to demonstrate the effectiveness of environmental and policy approaches in a target population versus a control or comparison population. However, none of the published studies that use community-wide environmental and policy strategies has adequately evaluated these approaches.

Table 7.1: Summary of environmental and policy approaches**Consistent evidence**

- Sign postings to promote stair use

Strategies with potential

- Provide new facilities (indoor and outdoor); bicycle and walking tracks
- Improve safety of commuting routes
- Increase access to physical activity recreation and transport environments (e.g. availability and access to green spaces, walking tracks, opening hours)
- Reduce premiums on health insurance for physical activity (e.g. walking or cycling to work, joining a health and fitness club)
- Increase supportive physical activity workplace environments (e.g. bicycle racks and shower facilities)

Strategies needing further evaluation

- Release time policies for physical activity in the workplace
- Financial and lottery incentives (reinforcement strategies)
- Passive environmental approaches (e.g. restricting motor vehicle traffic in city areas to increase foot and bicycle traffic)
- Increase access to public transport in outer suburban areas
- Intersectoral approaches (e.g. state and local government agencies and urban planning, transportation)
- Environmental and policy strategies with a theoretical underpinning (e.g. ecological models, social cognitive theory, behavioural choice theory – see Figure 1 for potential application)

Strategies to be developed

- Development of strategies to promote physical activity in children in school
- Development of strategies to reduce sedentary behaviours (e.g. television viewing)
- Development of strategies to promote incidental physical activity

There have been virtually no controlled trials evaluating the effects of community-wide physical activity programs. In Australia, the impact of mass media campaigns on physical activity has been modest, however, this is a strategy worth considering further. The weight of evidence consistently shows that mass media approaches can achieve modest, short-term physical activity behaviour change, particularly when they are a component of broader schemes to raise awareness and knowledge in community-based initiatives. Such methods are likely to have the greatest influence on knowledge and attitudes of people within the earliest stages of exercise adoption, particularly pre-contemplators (those not thinking about starting exercise) and contemplators (those thinking of starting exercise). Given this background, the development of combined mass media and other population and/or individual approaches to influence behaviour change is warranted. Consideration should also be given to the use of mass media approaches to target specific population sub-groups (e.g. those from low SES backgrounds). Table 7.2 describes strategies regarding mass media with the potential to promote physical activity.

Table 7.2: Summary of mass media approaches

<p>Consistent evidence</p> <ul style="list-style-type: none"> • Mass media approaches to achieve modest, short-term physical activity behaviour change • Use of mass media to raise awareness and knowledge, particularly when applied with community-based initiatives • Use of mass media to influence knowledge and attitudes, targeting those at the earliest stages of exercise adoption, particularly pre-contemplators and contemplators <p>Strategies with potential</p> <ul style="list-style-type: none"> • The development of combined mass media and other population and/or individual approaches to influence behaviour change • Use of mass media approaches targeted to specific sub-groups • Use of mass media approaches with different theoretical bases <p>Strategies needing further evaluation</p> <ul style="list-style-type: none"> • Combined physical activity and other health messages (e.g. healthy eating) using mass media approaches • Combining mass media with other informational strategies (e.g. physical activity messages on packaging, sponsorships, a physical activity symbol – such as the ‘red tick’ relating to heart health)

This review has shown that behaviour modification is the most effective individual approach for promoting initial increased physical activity. This argues for the use of individual approaches to target change in the behaviour of individuals. However, interventions focussing on the modification of individual behaviour are potentially more likely to be successful if the role of the setting, physical and social environment, and policy are taken into account. It is therefore important to consider individually-tailored behavioural models, in conjunction with organisational-level strategies, and environment and policy strategies to support sustained behaviour change. The special needs of particular population groups should also be considered, since different approaches are more effective for different sub-groups, and individual interventions focused on special sub-groups are more successful than those with a broader focus (Table 7.3).

Table 7.3: Summary of individual approaches

Consistent Evidence

- Individual print-based and settings-based approaches based on the following theoretical models of behaviour change: Theory of Reasoned Action, Stage of Change theory, Transtheoretical Model, and self-efficacy and decision-making constructs
- Stage-based, motivationally-targeted interventions
- Behavioural, or cognitive-behavioural strategies (e.g. goal-setting, self-monitoring)
- Combined group- and home-based programs
- In workplace settings: individualised counselling, feedback, health screening, exercise prescriptions, incentives for participation (Note, these strategies have not been successful in other settings such as schools)
- In schools: classroom physical education sessions, trained specialists/teachers, behaviour-based modules and curriculum, peer involvement, programs combining multiple strategies and focusing on both individual behaviour and the school environment

Strategies with potential

- Individual print-based interventions based on the following theoretical model of behaviour change: the Theory of Planned Behaviour (long-term success not known)
- Print-based interventions included as part of broader campaigns including mass media
- Informational approaches such as GP/health practitioner counselling
- Telephone-based counselling, either alone, or as a follow-up to GP counselling
- Automated telephone-delivered health advice, or telephone-linked care

- Use of screening programs, with diverse population groups
- Use of information technologies, Internet and email technologies and web-based delivery
- Use of different settings for physical activity promotion (e.g. higher education setting, home/family setting)
- Multi-factor focus (e.g. physical activity and eating behaviour, smoking, alcohol)

Strategies needing further evaluation

- Strategies addressing linguistic and sociocultural barriers to participation, and involving community groups when targeting ethnic sub-groups
- Generalisability of physical activity programs to different settings
- Comprehensive and systematic evaluation of workplace interventions, including those in moderate-sized workplaces, in a diverse range of SES and ethnic groups
- Assessment of different strategies to promote physical activity amongst those with individual and group differences (e.g. SES groups, ethnicity, sex, age, rural-dwellers)
- Evaluation of the application of 'intergenerational' physical activity programs that involve family and community members from different generations (older and younger age groups)
- Conducting studies that compare different methods of intervention rather than comparing just one method to a non-treatment 'control' or 'comparison' group
- The systematic application of theories and models for strengthening the development of interventions

Strategies to be developed

- Development of strategies to reduce sedentary behaviours (e.g. television viewing)
- Development of strategies to promote incidental physical activity
- Development of strategies to prevent physical activity declines in young adults
- Development of strategies to maintain physical activity throughout the lifespan and through key life events (e.g. leaving school, marriage, childbirth, retirement)
- Development of strategies to achieve longer-term effectiveness of individual approaches (e.g. print-based)

The evidence presented in this review, strongly argues for the development of individual print-based and settings-based approaches based on the following theoretical models of behaviour change: theory of reasoned action, stage of change theory, transtheoretical model, self-efficacy,

decision making. Such approaches have the advantage of being stage-based, motivationally-targeted interventions that incorporate strong behavioural, or cognitive-behavioural strategies (e.g. goal-setting, self-monitoring).

These approaches can be delivered in a variety of settings. This includes a combination of group- and home-based programs and strategies that could be successful in the workplace or healthcare setting such as individualised counselling, feedback, health screening, exercise prescriptions, incentives for participation. In the school setting, individual approaches can be delivered through classroom PE sessions, trained specialists/teachers, behaviour-based modules and curriculum, peer involvement, programs combining multiple strategies and focusing on both individual behaviour and the school environment. This report has described a number of groups who would benefit from specially targeted physical activity promotion messages. For example: children, older adults, and people from low SES backgrounds are important sub-groups to be targeted for physical activity intervention. In addition to the identification of particular population sub-groups at which physical activity strategies should be aimed, this report has highlighted the value of considering settings approaches to the delivery of physical activity health promotion messages.

The studies reviewed in this report were limited by a number of aspects. There has been a lack of formal evaluation of many of the physical activity programs. Most evaluation studies have been conducted in the short-term only, and very few studies included long-term follow-up of program effectiveness. A further limitation to these studies is they have often been applied to homogenous samples, thus strategies have been assessed in a restricted number of groups in the population. Further, the evaluation of effectiveness of studies has also been limited by the use of self-report measures that are lacking in sufficient sensitivity to detect change, and/or the use of measures for which reliability and validity have not been established. Many of the physical activity interventions suffered from poor recruitment of participants, high attrition (drop-out rate), and low participation. In addition, in many interventions and studies to promote physical activity there is a lack of theoretical underpinning. However, based on the strengths and limitations of the evidence, specific recommendations for VicHealth are provided in Chapter 8.

CHAPTER EIGHT: RECOMMENDATIONS

The evidence summarised in Chapter 7 indicates that international and Australian studies promoting physical activity demonstrate that no single approach has succeeded in initiating and sustaining long-term physical activity behaviour. Thus small-scale, short-term studies to promote physical activity are unlikely to be sustainable or to significantly impact on physical activity behaviour. To date, most physical activity interventions have focused on the individual, and without supportive environments it has been argued that physical activity behaviour is less likely to be maintained (Sallis & Owen, 1999). The most successful physical activity promotion strategy will be one that incorporates a number of elements and adopts a number of approaches concurrently. Strategies with consistent evidence for their effectiveness may be adopted immediately in broad-based physical activity strategies. However, without a coordinated approach the issues identified in this review will not be adequately addressed. A coordinated approach offers the greatest potential for implementing the National Physical Activity guidelines (Commonwealth Department of Health & Aged Care, 1999). Strategies that have potential should be seriously considered for inclusion in physical activity initiatives. More developmental work and pilot studies need to be undertaken before such strategies can be recommended for wide scale implementation.

Based on the current evidence of the effectiveness of strategies to promote physical activity, a number of specific recommendations for VicHealth to consider are provided. There is potential for VicHealth to take a leadership role in this area, especially if it adopts a firm evaluation strategy to accompany any physical activity promotion approach.

RECOMMENDATIONS FOR A BROAD APPROACH

- Recommendation 1: VicHealth should be active in contributing to a strong evidence base of physical activity promotion strategies in Australia.
- Recommendation 2: VicHealth should adopt a multi-level, multi-strategy physical activity promotion approach that emphasises combined environmental, policy and individual strategies.
- Recommendation 3: All physical activity promotion strategies undertaken or funded by VicHealth should include a formal evaluation component that documents process, impact AND quantifiable outcome measures. Such evaluations should be designed well and include control or comparison groups (see Appendix A).
- Recommendation 4: VicHealth should ensure that the appropriate criteria and measurements are incorporated into all the evaluation of effectiveness of the physical activity promotion approach/es.

- Recommendation 5: VicHealth should invest in joint strategies to promote physical activity and other health behaviours.
- Recommendation 6: Establishment of a central physical activity promotion and evaluation unit to monitor and formally evaluate physical activity programs and interventions.

RECOMMENDATIONS FOR IMPLEMENTATION

On balance, physical activity strategies that incorporate environmental and/or policy approaches are likely to be the most effective. However, the only strategy that has been consistently demonstrated to be effective is sign postings to promote stair use.

- Recommendation 7: VicHealth should consider the development of high profile and highly visible signage to promote the use of stairs in public places (e.g. shopping centres).
- Recommendation 8: VicHealth should work with local government, facilities managers and others involved in providing facilities and environments for physical activity to ensure that they are of an adequate standard, are safe and have a wide access for people of all ages and at various times of the day/week.
- Recommendation 9: VicHealth should continue to promote ongoing initiatives that minimise the severity and frequency of sports injuries.
- Recommendation 10: VicHealth, in conjunction with other health bodies, should lobby the health insurance industry for a reduction in premiums for people who regularly undertake physical activity.
- Recommendation 11: Through its workplace settings network, VicHealth should encourage health promoting workplaces to increase their support for physical activity by providing showers and safe storage areas for bicycles, etc.

The weight of evidence consistently shows that mass media approaches can achieve modest, short-term physical activity behaviour change, particularly when they are a component of broader schemes to raise awareness and knowledge in community-based initiatives. Such methods are likely to have the greatest influence on knowledge and attitudes of people within the earliest stages of exercise adoption. The development of combined mass media and other population and/or individual approaches to influence behaviour change is warranted.

- Recommendation 12: VicHealth should incorporate mass media approaches as a vital component of community-based initiatives to increase physical activity levels.
- Recommendation 13: VicHealth should consider combining physical activity health promotion messages with those addressing other health messages (e.g. healthy eating) in its broader mass media approaches.

- Recommendation 14: VicHealth should consider combining mass media physical activity promotion approaches with other informational strategies (e.g. physical activity messages on packaging, health promotion sponsorships, a physical activity symbol – such as the ‘red tick’ relating to heart health).
- Recommendation 15: VicHealth should develop a physical activity promotion logo and message that is incorporated into all of its physical activity promotion activities.

This review has shown that behaviour modification is the most effective individual approach for promoting initial increases in physical activity. These approaches should be delivered in a variety of physical activity settings.

- Recommendation 16: VicHealth should support, and help facilitate, the development and implementation of individual physical activity approaches in schools, healthcare settings and workplace settings.
- Recommendation 17: VicHealth should give consideration to the development of strategies addressing linguistic and socio-cultural barriers to participation, and involving community groups when targeting ethnic sub-groups. This is an area that has not received previous attention.
- Recommendation 18: VicHealth should consider the development of particular strategies aimed at promoting physical activity in children at school, at home and for reducing the prevalence of sedentary behaviours (e.g. television viewing).
- Recommendation 19: VicHealth should develop and assess the effectiveness of different strategies to promote physical activity amongst those with individual and group differences (e.g. low socioeconomic status groups, ethnicity, sex, age, rural dwellers, indigenous Australians).

PRIORITY GROUPS AND SETTINGS

This report has described a number of groups who would benefit from specifically-targeted physical activity promotion strategies. In addition to the identification of particular population sub-groups at which physical activity strategies should be aimed, this report has highlighted the value of considering settings approaches to the promotion of physical activity.

- Recommendation 20: VicHealth should develop and implement strategies aimed specifically at children because of the need to lay down a basis of lifelong participation when young, and the increasing sedentary behaviours in this group.

- Recommendation 20: VicHealth should specifically target physical activity levels in older people to ensure their continued and improved functional fitness in older age, and reduced risk of falling.
- Recommendation 21: VicHealth should develop physical activity strategies appropriate for targeting socio-disadvantaged groups, as these groups have not been the focus of much previous attention but they are likely to benefit significantly from physical activity promotion strategies.
- Recommendation 22: VicHealth should consider developing physical activity promotion strategies aimed at workers involved in sedentary occupations.
- Recommendation 23: VicHealth should give strong consideration to adopting a settings approach to the delivery of physical activity promotion messages. In particular, it should consider message delivery through schools, health care settings, workplaces and places for sport and recreation.

SUMMARY

International and Australian studies promoting physical activity show that no single approach has succeeded in effecting long-term physical activity behaviour. To date, most physical activity interventions have focused on the individual, and without supportive environments it is unlikely that positive physical activity behaviours will be maintained. This report recommends a multi-level, multi-strategy approach that emphasises combined environmental, policy and individual strategies as having the most potential for initiating and sustaining physical activity behaviour change. Although this type of approach would require support from all levels of society, and substantial funding to establish, it is the most likely means of achieving long-term sustainability.

REFERENCES

Aaron DJ, Dearwater SR, Anderson R, Olsen T, Kriska AM, Laporte RE. (1995). Physical activity and the initiation of high-risk health behaviours in adolescents. *Medicine and Science in Sports and Exercise*, 27.

Abrams DB. (1993). Treatment issues: towards a stepped-care model. *Tobacco Control* 2(Supp): S17-S37.

AC Nielsen (1999). TV Trends 1999. ACNielsen Media, Melbourne, Australia, p.6-7.

Ainsworth BE, Haskell WL, Leon AS, Jacobs DR, Montoye HJ, Sallis JF, Paffenbarger RS. (1993). Compendium of physical activities: classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise*, 25: 71-80.

Ainsworth BE, Irwin ML, Addy CL, Whitt MC, Storlarczyk LM. (1999). Moderate physical activity patterns of minority women: The cross cultural activity participation study. *Journal of Women's Health and Gender-Based Medicine*, 8: 805.

Ajzen I. (1991). The theory of planned behaviour. *Organisational Behavior and Human Decision Processes*, 50: 179-211.

American College of Sports Medicine. (1998). Position stand on exercise and physical activity for older adults. *Medicine and Science in Sports and Exercise*, 30: 992-1008.

Ashenden R, Silagy C, Weller D. (1997). A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice*, 14: 160-175.

ASSO (1999). *An educational resource from the Australasian Society for the Study of Obesity*. Sydney: Australasian Society for the Study of Obesity.

Australian Bureau of Statistics (ABS). (1994). *How Australians use their time*. Canberra, Commonwealth Government.

Australian Bureau of Statistics (ABS). (1995a). *National Nutrition Survey. Selected Highlights*. ABS Catalogue No.4802.0. Australian Bureau of Statistics: Canberra.

Australian Bureau of Statistics (ABS). (1995b). *The Labor Force Australia*. Report No 6203.0. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics (ABS). (1997). *Australia at a glance*. Report No. 4309.0. Canberra: Australian Bureau of Statistics.

Australian Institute of Health and Welfare. (1997). *Health trends 1995*. Canberra: Australian Government Publishing Service.

Australian Bureau of Statistics (ABS). (1999). *Participation in Sport and Physical Activity*. Canberra: Australian Government Publishing Service.

Australian Institute of Health and Welfare. (1998). *Australia's Health: 1988*. Canberra: Australian Government Publishing Service.

Australian Sports Commission. (1997). *Active Australia: a national participation framework*. Report No. 0 642 26317 5. Canberra: Australian Sports Commission.

Bandura A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura A. (1997a). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Co.

Bandura A. (1997b). Self-efficacy: Toward a unifying theory of behavioural change. *Psychology Review* 84: 191-215.

Baranowski T, Andersen C, Carmack C. (1998). Mediating variable framework in physical activity interventions: How are we doing? How might we do better? *American Journal of Preventive Medicine*, 15: 266-297.

Bauman A, Bellew B, Booth M, Hahn A, Stoker L, Thomas M. (1996). *NSW Health Promotion Survey 1994: Towards best practice for the promotion of physical activity in the Areas of New South Wales*. NSW Health Department, Centre for Disease Prevention and Health.

Bauman A, Owen N. (1991). Habitual physical activity and cardiovascular risk factors. *Medical Journal of Australia*, 154: 22-28.

Bauman A, Owen N. (1999). Physical activity of adult Australians: Epidemiological evidence and potential strategies for health gain. *Journal of Science and Medicine in Sport*, 2: 30-41.

Bauman A, Owen N, Rushworth RL. (1990). Recent trends and socio-demographic determinants of exercise participation in Australia. *Community Health Studies*, 14(1), 19-26.

Becker MH. (1974). (Ed.). The health belief model and personal health behavior. *Health Education Monographs*, 2: 324-473.

Beckie T. (1989). A supportive-educative telephone program: impact on knowledge and anxiety after coronary artery bypass graft surgery. *Heart and Lung*, 18: 46-55.

Bennett SA, Magnus P. (1994). Trends in cardiovascular risk factors in Australia: Results from the National Heart Foundation's Risk Factor Prevalence Study, 1980-1989. *Medical Journal of Australia*, 161: 519-527.

Bennett B and Murphy S. (1997). Environmental and public policy approaches. In: Payne S, Horne S. (Eds). *Psychology and health promotion*. Buckingham, UK: Open University Press.

Bishop GD, Converse SA. (1986). Illness representations: A prototype approach. *Health Psychology, 5*: 95-114.

Blair SN, Applegate WB, Dunn AL, Ettinger WH, Haskell WL, King AC, Morgan TM, Shih JA, Simons-Morton DG. (1998). Activity Counselling Trial (ACT): rationale, design, and methods. *Medicine and Science in Sports and Exercise, 30*: 1097-1106.

Blair SN, Booth M, Gyarfás I, Iwane H, Marti B, Matsudo V, Morrow MS, Noakes T, Shephard R. (1996). Development of public policy and physical activity initiatives internationally. *Sports Medicine, 21*: 157-163.

Blair SN, Kohl HW, Barlow CE, Paffenbarger RS, Gibbons LW, Macera CA. (1995). Changes in physical fitness and all-cause mortality—a prospective study of healthy and unhealthy men. *Journal of the American Medical Association, 273*: 1093-1098.

Blair SN, Kohl HW, Paffenbarger RS, Clark DG, Cooper KH, Gibbons LW. (1989). Physical fitness and all-cause mortality: A prospective study of healthy men and women. *Journal of the American Medical Association, 262*: 2395-2401.

Blair SN, Jacobs DR, Powell KE. (1985). Relationships between exercise or physical activity and other health behaviours. *Public Health Reports, 100*: 172-180.

Blair SN, Piserchia PV, Wilbur CS, Crowder JH. (1986). A public health intervention model for work-site health promotion. *Journal of the American Medical Association, 255*: 921-926.

Blamey A, Mutrie N, Aitchison T. (1995). Health promotion by encouraged use of stairs. *British Medical Journal, 311*: 289-290.

Booth ML, Bauman A, Oldenburg B, Owen N, Magnus P. (1992). Effects of a national mass-media campaign on physical activity participation. *Health Promotion International, 7*: 241-247.

Booth ML, Bauman A, Owen N, Gore CJ. (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine, 26*: 131-137.

Booth ML, Macaskill P, Phongsavan P, McLellan L, Okely T. (1998). Methods of the NSW schools fitness and physical activity survey, 1997. *Journal of Science and Medicine in Sport, 1*:111-124.

Booth ML, Owen N, Bauman A, Gore CJ. (1996a). Relationship between a 14-day recall measure of leisure time physical activity and a submaximal test of physical work capacity in a population sample of Australian adults. *Research Quarterly for Exercise and Sport, 67*: 221-227.

Booth ML, Owen N, Bauman A, Gore CJ. (1996b). Retest reliability of recall measures of leisure-time physical activity in Australian adults. *International Journal of Epidemiology, 25*: 153-159.

Booth ML, Macaskill P, McLellan L, Phongsavan P, Okely T, Patterson J, Wright J, Bauman A, Baur L. (1997). *NSW Schools Fitness and Physical Activity Survey*. Sydney: NSW Dept of School Education.

Booth ML, Samdal O. (1997). Health promoting schools in Australia: models and measurement. *Australian and New Zealand Journal of Public Health*, 21: 365-370.

Borland R, Owen N. (1995). Need to smoke in the context of workplace smoking bans. *Preventive Medicine*, 24: 56 - 60.

Bracht N. (Ed.). (1990). *Health promotion at the community level*. Newbury Park, CA: Sage.

Bridges-Webb C, Britt H, Miles DA, Neary S, Charles J, Traynor V. (1993). Morbidity and treatment in general practice in Australia. *Australian Family Physician*, 22: 336-346.

Brookes SV, Faulkner JA. (1994). Skeletal muscle weakness in old age: underlying mechanisms. *Medicine and Science in Sports and Exercise*, 26: 432-439.

Brown WJ, Fuller B, Lee C, Cockburn J, Adamson L. (1999). Never too late: Older people's perceptions of physical activity. *Health Promotion Journal of Australia*, 9: 55-63.

Brown W, Lee C. (1994). Exercise and dietary modification with women of non-English speaking background: A pilot study with Polish-Australian women. *International Journal of Behavioral Medicine*, 1: 185-203.

Brown W and Lee C. (1998). Australian migrant women and physical activity. Attitudes, barriers, preferences and participation. *ACHPER*, 45(3), p.5-10.

Brown WJ, Lee C, Nasstasia YN. (1997). Heart health for migrant women. *Health Promotion Journal of Australia*, 7: 134-137.

Brown WJ, Lee C, Oyomopito R. (1996). Effectiveness of a bilingual heart health program for Greek-Australian women. *Health Promotion International*, 11: 117.

Brownell KD, Marlatt GA., Lichtenstein E, et al. (1986). Understanding and preventing relapse. *American Psychologist*, 41: 765-782.

Brownell KD, Stunkard AJ, Albaum JM. (1980). Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry*, 137: 1540-1545.

Bull FC, Schipper EC, Jamrozik K, Blanksby BA. (1997). How can and do general practitioners promote physical activity. *Preventive Medicine*, 26: 866-873.

Burke V, Milligan RAK, Beilin LJ, Dunbar D, Spencer M, Balde E, Gracey MP. (1997). Clustering of health-related behaviors among 18-year-old Australians. *Preventive Medicine*, 26: 724-733.

Burn GE, Naylor P-J, Page A. (1999). Assessment of stages of change for exercise within a worksite lifestyle screening program. *American Journal of Health Promotion*, 13: 143-145.

Campbell AJ, Borrie MJ, Spears GF. (1989). Risk factors for falls in a community-based prospective study of people 70 years and older. *Journal of Gerontology*, 44: 112-117.

Cardinal B, Sachs M. (1995). Prospective analysis of stage-of-exercise movement following mail delivered, self-instructional exercise packets. *American Journal of Health Promotion*, 9: 430-432.

Cardinal B, Sachs M. (1996). Effects of mail-mediated, stage-matched exercise behavior change strategies on female adults' leisure-time exercise behavior. *Journal of Sports Medicine and Physical Fitness*, 36: 100-107.

Carlin JB, Stevenson MR, Roberts I, Bennett CM, Gelman A, Nolan T. (1997). Walking to school and traffic exposure in Australian children. *Australian and New Zealand Journal of Public Health*, 21: 286-292.

Caspersen CJ, Powell KE, Christenson GM. (1985). Physical activity, exercise, and physical fitness: Definition and distinctions for health-related research. *Public Health Reports*, 100: 126-131.

Cavill N. (1998). National campaigns to promote physical activity: Can they make a difference? *International Journal of Obesity*, 22: S48-S51.

Ching PLYH, Willett WC, et al. (1996). Activity level and risk of overweight in male health professionals. *American Journal of Public Health*, 86: 25-30.

Columbia Ministry of Health. (1992). *The VIC declaration on heart health*. British Columbia: Columbia Ministry of Health.

Commonwealth Department of Health and Aged Care (1999). *National Physical Activity Guidelines for Australians: Active Australia*. Canberra, Australia.

Commonwealth Department of Health and Family Services (1998). *Developing Active Australia: A framework for action for physical activity and health*. Canberra, Australia. p.3-16.

Commonwealth Department of Health and Human Services. (1994). *National Goals, Targets and Strategies for Better Health Outcomes into the next century*. Canberra: Australian Government Publishing Service.

Commonwealth Department of Health and Human Services. (1993). *Goals & Targets for Australia's Health in the year 2000 and beyond*. Canberra: Australian Government Publishing Service.

Commonwealth Department of Human Services and Health (CDHSH). (1994). *Better health outcomes for Australians. National goals, targets and strategies for better health outcomes into the Next Century*. Canberra: Australian Government Publishing Service.

Corti B, Donovan RJ, Holman CD'AJ. (1996). Factors influencing the use of physical activity facilities: results from qualitative research. *Health Promotion Journal of Australia*, 6: 16-21.

Corti B, Holman CD'AJ, Donovan R, Broomhall M. (1997, 20-21 March 1997). *Does the accessibility of community recreational facilities influence physical activity levels?* Paper presented at the National Physical Activity, Sport and Health Conference, Melbourne.

Crawford D, Owen N. (1994). The behavioural epidemiology of weight control. *Australian Journal of Public Health*; 18: 143-148

Crawford D, Owen N, Broom D, Worcester M & Oliver G. (1998). Weight-control practices of adults in a rural community. *Australian and New Zealand Journal of Public Health*, 22(1):73-79.

Crespo CJ, Ainsworth BE, Keteyian SJ, Heath GW, Smit E. (1999). Prevalence of physical inactivity and its relation to social class in US adults: results from the Third National Health and Nutrition Examination Survey, 1988-1994. *Medicine and Science in Sports and Exercise*, 31: 1821-1827.

Cunningham DA, Paterson DH, Himann JE, Rechnitzer PA. (1993). Determinants of independence in the elderly. *Canadian Journal of Applied Physiology*, 18: 243-254.

Dale D, Corbin CB, Cuddihy TF. (1998). Can conceptual physical education promote physically active lifestyles? *Pediatric Exercise Science*, 10: 97-109.

Davis SM, Lambert LC, Gomez Y, Skipper B. (1995). Southwest cardiovascular curriculum project: Study findings for American Indian elementary students. *Journal of Health Education*, 26: S72-S81.

de Groot A. (1969). *Methodology: Foundations of inference and research in the behavioural sciences*. Trans. JAA Spiekerman. The Hague, Mouton.

DeBusk RF, Stenestrand U, Sheehan M, Haskell WL. (1990). Training effects of long versus short bouts of exercise in healthy subjects. *American Journal of Cardiology*, 65: 1010-1013.

Delaney W, Lee C. (1995). Self-esteem and sex roles among male and female high school students: Their relationship to physical activity. *Australian Psychologist*, 30: 84-87.

Department of the Arts, Sports, the Environment and Territories (DASET). (1992). *Pilot Survey of the Fitness of Australians*. Canberra: Australian Government Publishing Service.

Department of Human Services (1998). Active for Life: Physical activity patterns and health impacts in Victoria. Health Promotion Strategy Unit, Public Health and Development Division, Melbourne, Victoria.

Department of Human Services (1999). Active for Life Goals and Strategies: Draft Document. Melbourne, Victoria.

DeVries HA. (1981). Tranquilizer effect of exercise: A critical review. *Physician and Sportsmedicine*, 9: 47-55.

DiClemente CC, Prochaska JO, Fairhurst SK, et al. (1991). The process of smoking cessation: An analysis of the precontemplation, contemplation and preparation stages of change. *Journal of Consulting and Clinical Psychology*, 59: 295-304.

DiConza S, (1997) Assessment of occupational physical activity in male factory workers. (Unpublished Honours Dissertation, Deakin University, Melbourne, Australia.

Dietz WH, Gortmaker SL (1985). Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics*, 75: 807-812.

Dietz WH, (1996). The role of lifestyle and health: The epidemiology and consequences of physical inactivity. *Proceedings of the Nutrition Society*, 55: 829-840.

DiPietro L. (1995). Physical activity, body weight, and adiposity: An epidemiologic perspective. *Exercise and Sports Sciences Reviews*, 23: 275-303.

Directorate of School Education (1993). Physical and Sport Education for Victorian Schools: Report of the Committee for the review of Physical and Sport Education in Victorian Schools. Melbourne, Victoria, Australia.

Dirkin G. (1994). Technological supports for sustaining exercise. In: Dishman R (Ed). *Advances in exercise adherence*. Champaign, IL: Human Kinetics.

Dishman RK. (1994). The measurement conundrum in exercise adherence research. *Medicine and Science in Sports and Exercise*, 26: 1382-1390.

Dishman RK, Oldenburg B, O'Neal H, Shepard RJ. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine*, 15: 344-361.

Dishman RK, Sallis JF. (1994). Determinants and interventions for physical activity and exercise. In: Bouchard C, Shephard RJ, Stephens T (Eds.), *Physical activity, fitness and health: International proceedings and consensus statement* (pp. 214-238). Champaign, Illinois: Human Kinetics.

Dishman RK, Sallis JF, Orenstein DR. (1985). The determinants of physical activity and exercise. *Public Health Reports*, 100: 158-171.

Dobbins T, Simpson J, Oldenburg B, Owen N, & Harris D. (1998). Who comes to a workplace health risk assessment? *International Journal of Behavioural Medicine*, 5(4):323-334.

Donnelly JE, Jacobsen DJ, Whately JE, et al. (1996). Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obesity Research*, 4: 229-243.

Donovan JE, Jessor R, et al. (1988). Syndrome of problem behaviour in adolescence: a replication. *Journal of Consulting and Clinical Psychology*, 54: 762-765.

Donovan RJ, Owen N. (1994). Social marketing and population interventions. In: Dishman RK. (Ed.). *Advances in Exercise Adherence*. Champaign, Illinois: Human Kinetics. 249-290.

Donovan RJ, Robinson L. (1992). Using mass media in health promotion: The Western Australia immunization campaign. In: Hall R, Richters J. (Eds.). *Immunization: The old and the new*. Canberra, Australia: Public Health Association of Australia.

Duncan BB, Chambless LE, Schmidt MI, et al. (1993). Correlates of body fat distribution: Variation across categories of race, sex, and body mass in the Atherosclerosis Risk in Communities Study. *AEP*, 5: 192-200.

Dunn AL, Andersen RE, Jakicic JM. (1998). Lifestyle physical activity interventions: History, short- and long-term effects, and recommendations. *American Journal of Preventive Medicine*, 15: 398-412.

Dunn AL, Marcus BH, Kampert JB, Garcia ME, Kohl HW, Blair SN. (1997). Reduction in cardiovascular disease risk factors: 6 month results from Project Active. *Preventive Medicine*, 26: 883-892.

Eaton CB, Menard LM. (1998). A systematic review of physical activity promotion in primary care settings. *British Journal of Sports Medicine*, 32:11-16.

Ebisu JT. (1985). Splitting the distance of endurance running: On cardiovascular endurance and blood lipids. *Japanese Journal of Physical Education*, 30: 37-43.

Egger G, Donovan R, Swinburn B, Giles-Corti B, Bull F. (1999). *Physical activity guidelines for Australians: Scientific background report*. Sydney: University of Western Australia and the Centre for Health Promotion.

Egger G, Spark R, Lawson J. (1991). *Health promotion strategies and methods*. Sydney: McGraw-Hill.

Emmons KM, Linnan LA, Shadel WG, Marcus B, Abrams DB. (1999). The healthy working project: A worksite health-promotion trial targeting physical activity, diet, and smoking. *Journal of Occupational and Environmental Medicine*, 41: 545.

Epstein LH. (1998). Integrating theoretical approaches to promote physical activity. *American Journal of Preventive Medicine*, 15: 257-265.

Epstein LH, Wing RR, Thompson JK, Griffen W. (1980). Attendance and fitness in aerobics exercise: The effects of contract and lottery procedures. *Behavior Modification*, 4: 465-479.

Farquar, J. (1978). The community based model of lifestyle intervention trials. *American Journal of Epidemiology*, 108: 103-111.

Felton G, Parsons M. (1994). Factors influencing physical activity in average-weight and overweight young women. *Journal of Community Health Nursing*, 11: 109-119.

Fentem PH. (1996). A national strategy for the promotion of physical activity. *British Journal of Sports Medicine*, 30: 280-281.

Finch C, McGrath A. (1997). *SportSafe Australia: A national sports safety framework. A report prepared for the Australian Sports Injury Prevention Taskforce*. Canberra: SportSafe Australia, Australian Sports Commission.

Finch C, & Owen N. Injury prevention and the promotion of physical activity: what is the nexus? *Journal of Science and Medicine in Sport*. (In press, 2000).

Fishbein M, Ajzen I. (1975). *Beliefs, attitudes, intention and behaviour: An introduction to theory and research*. Boston, MA: Addison-Wesley.

Fishbein M. (1972). Toward an understanding of family planning behaviour. *Journal of Applied Social Psychology*, 2: 214-227.

Fishbein M. (1980). A theory of reasoned action: Some applications and implications. In: Page MM. (Ed.). *1979 Nebraska Symposium on motivation*. Lincoln, NE: University of Nebraska Press.

Fisher K, Ritchie C, Abernathy P, Hutchins C, Ford C, Miller R. (1998). 'Just Walk It': Enhancing community participation in physical activity. *Health Promotion Journal of Australia*, 8: 140-144.

Flora J, Maibach E, Maccoby N. (1989). The role of mass media across four levels of health promotion intervention. *Annual Review of Public Health*, 10: 181-201.

Forster JL, Jeffery RW, Schmid TL, Kramer FM. (1988). Preventing weight gain in adults: A pound of prevention. *Health Psychology*, 7: 515-25.

Fotheringham MJ, Owen N. (1999). Applying psychological theories to promote healthy lifestyles. In: Rippe JM (Ed.). *Lifestyle Medicine*. Shrewsbury, MA: Blackwell Science. 501-510.

Fotheringham MJ, Owen N. (in press). Interactive Health Communication in Preventive Medicine. *American Journal of Preventive Medicine*, 18:

Fotheringham MJ, Owies D, Leslie E, Owen N. (in press). Interactive health communication in preventive medicine: Internet-based strategies in teaching and research. *American Journal of Preventive Medicine*, 18:

Fotheringham MJ, Sawyer MG. (1995). Adherence to medical recommendations in childhood and adolescence. *Journal of Paediatrics and Child Health*, 31: 72-78.

Fotheringham MJ, Wonnacott RL, Owen N. (in press). Computer-use and physical inactivity in young adults: Public health perils and potentials of new information technology. *Annals of Behavioral Medicine*.

Friedman RH. (1998). Automated telephone conversations to assess health behaviour and deliver behavioural interventions. *Journal of Medical Systems*, 22: 95-102.

Fries JF, Bloch DA, Harrington H, Richardson N, Beck R. (1993). Two year results of a randomised controlled trial of a health promotion program in a retiree population: The Bank of America Study. *American Journal of Medicine*, 94: 455-462.

Garding BS, Kerr JC, Bay K. (1988). Effectiveness of a program of information and support for myocardial infarction patients recovering at home. *Heart and Lung*, 17: 355-362.

Garrow JS, Summerbell CD. (1995). Meta-analysis: effect of exercise, with or without dieting, on the body composition of overweight subjects. *European Journal of Clinical Nutrition*, 49: 1-10.

Georgiou CC, Betts NM, Hoerr SL, Keim K, Peters PK, Stewart B, Voichick J. (1997). Among young adults, college students and graduates practiced more healthful habits and made more healthful food choices than did non-students. *Journal of the American Dietetic Association*, 97(7), 754-759.

Glanz K, Lewis FM, Rimer BK. (Eds.). (1990). *Health behaviour and health education: Theory, research, and practice*. San Francisco: Jossey-Bass.

Glanz K, Lewis FM, Rimer BK. (Eds.). (1996). *Health behaviour and health education: Theory, research, and practice*. 2nd Edition. San Francisco: Jossey-Bass.

Glasgow RE, Terborg JR. (1988). Occupational health promotion programs to reduce cardiovascular risk. *Journal of Consulting and Clinical Psychology*, 56: 365-373.

Glenny AM, O'Meara S, Melville A, Sheldon TA, Wilson C. (1997). The treatment and prevention of obesity: a systematic review of the literature. *International Journal of Obesity*, 21: 715-737.

Golaszewski T, Barr D, Cochran S. (1998). An organization-based intervention to improve support for employee heart health. *American Journal of Health Promotion*, 13: 26-35.

Gomel M, Oldenburg B, Simpson J, Owen N. (1993). Worksite cardiovascular risk reduction: Randomised trial of health risk assessment, risk factor education, behavioral counselling and incentive strategies. *American Journal of Public Health, 83*: 1231-1238.

Gordon-Larsen P, McMurray RG, Popkin BM. (1999). Adolescent physical activity and inactivity vary by ethnicity: The National Longitudinal Study of Adolescent Health. *Journal of Pediatrics, 135*: 301-306.

Gore CJ, Booth ML, Bauman A, Owen N. (1999). Utility of pwc75% as an estimate of aerobic power in epidemiological and population-based studies. *Medicine and Science in Sports and Exercise, 31*: 348-351.

Gortmaker SL, Must A, et al. (1996). Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Archives of Pediatric and Adolescent Medicine, 150*: 356-362.

Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N. (1999). Reducing obesity via a school-based interdisciplinary intervention among youth. *Archives of Pediatrics and Adolescent Medicine, 153*: 409.

Gortner SR, Jenkins, LA. (1990). Self-efficacy and activity levels following cardiac surgery. *Journal of Advanced Nursing, 15*: 1132-1138.

Gran B. (1995). Major differences in cardiovascular risk indicators by educational status. Results from a population based screening program. *Scandinavian Journal of Social Medicine, 23*: 1-16.

Grilo CM. (1995). The role of physical activity in weight loss and weight loss management. *Medicine, Exercise, Nutrition, and Health, 4*: 60-76.

Hahn A, Craythorn E. (1994). Inactivity and the physical environment in two regional centres. *Health Promotion Journal of Australia, 4*(2):43-45.

Hallam J, Petosa R. (1998). A worksite intervention to enhance social cognitive theory constructs to promote exercise adherence. *American Journal of Health Promotion, 13*: 4-7.

Halloran J, Dunt DR, Young D. (1993). Coronary risk factors, knowledge and beliefs in blue-collar men attending general practice. *Australian Family Physician, 22*: 351-355.

Harrell JS, McMurray RG, Bangdiwala SI, Frauman AC, Gansky SA, Bradley CB. (1996). Effects of a school-based intervention to reduce cardiovascular disease risk factors in elementary-school children: The Cardiovascular Health in Children (CHIC) study. *Journal of Pediatrics, 128*: 797-805.

Hawe P, Degeling D, Hall J. (1990). *Evaluating health promotion: A health workers' guide*. Sydney: McLennan and Petty.

Heaney CA, Goetzel RZ. (1997). A review of health-related outcomes of multi-component worksite health promotion programs. *American Journal of Health Promotion*, 11: 290-308.

Heirich MA, Foote A, Erfut JC, Konopka B. (1993). Worksite physical fitness programs: Comparing the impact of different programs on cardiovascular risks. *Journal of Occupational Medicine*, 35: 510-517.

Hendricks SJ, Freeman R, Sheilham A. (1990). Why inner city mothers take their children for routine medical and dental examination. *Community Dental Health* 7: 33-41.

Hill JO, Schlundt DG, Sbrocco T, Sharp T, Pope-Cordie J, Stetson B, Kaler M, Heim C. (1989). Evaluation of an alternating-calorie diet with or without exercise in the treatment of obesity. *American Journal of Clinical Nutrition*, 50: 248-254.

Holman CD'AJ, Corti B, Donovan R, Jalleh G. (1998). Association of the health promoting workplace with trade unionism and other industrial factors. *American Journal of Health Promotion*, 12: 325-344.

Huang Y, Macera CA, Blair SN, Brill PA, Kohl HW, et al. (1998). Physical fitness, physical activity and functional limitation in adults aged 40 and older. *Medicine and Science in Sports and Exercise*, 30:1430-1435.

Human Services Department (HSD). (1998). *Evidence based planning framework*. Human Services Department.

Irish Heart Foundation. (1997). *Walking exercise: Sli na Slante*. Landsdowne Market Research Report.

Janz NK, Becker MH. (1984). The health belief model: A decade later. *Health Education Quarterly*, 11: 1-47.

Jarvis KL, Friedman RH, Heeren T, Cullinane PM. (1997). Older women and physical activity: Using the telephone to walk. *Women's Health Issues*, 7: 24-29.

Jeffery RW, French SA. (1999). Preventing weight gain in adults: The Pound of Prevention Study. *American Journal of Public Health*, 89: 747-751.

Jette AM, Branch LG. (1981). The Framingham disability study 11 - Physical disability among the aging. *American Journal of Public Health*, 71: 1211-1216.

Johnson MF, Nichols JF, Sallis JF, Calfas KJ, Hovell MF. (1998). Interrelationships between physical activity and other health behaviours among university women and men. *Preventive Medicine*, 27: 536-544.

Jones BH, Cowan DN, Knapik JJ. (1994). Exercise, training and injuries. *Sports Medicine*, 18:202-214.

Jones J, Owen N. (1998). Neighbourhood walk: A local community-based program to promote physical activity among older adults. *Health Promotion Journal of Australia*, 8: 145-147.

Jones JA, LeRossignol P. (1995). Physical and social adaptations of the older exercising female. Conference paper, *Biennial Conference of the Australian Council for Health, Physical Education and Recreation*. Melbourne.

Jones-Webb R, Short B, Wagenaar A, Toomey T, Murray D, Wolfson M, Forster J. (1997). Environmental predictors of drinking and drinking-related problems in young adults. *Journal of Drug Education*, 27(1), 67-82.

Kau M, Fischer J. (1974). Self-modification of exercise behavior. *Journal of Behavior Therapy and Experimental Psychiatry*, 5: 213-4.

Killen JD, Telch MJ, Robinson TN, Maccoby N, Taylor B, Farquar J. (1988). Cardiovascular disease risk reduction for tenth graders. A multiple-factor school-based approach. *Journal of the American Medical Association*, 26: 1728-1733.

Killoran A, Fentem P, Caspersen C. (1994). *Moving on: International perspectives on promoting physical activity*. London, UK: Health Education Authority.

King AC. (1999). Environmental and policy approaches to the promotion of physical activity. In: Rippe JM (Ed.). *Lifestyle Medicine*. Shrewsbury, MA: Blackwell Science. 1298-1303.

King AC, Birkel CF, Haskell WL. (1988). Increasing exercise among blue-collar employees: the tailoring of worksite programs to meet specific needs. *Preventive Medicine*, 17:357-65.

King AC, Blair SN, Bild DE, Dishman RK, Dubbart PM, Marcus BH, Oldridge NB, Paffenbarger RS, Powell KE, Yeager KK. (1992). Determinants of physical activity and interventions in adults. *Medicine and Science in Sports and Exercise*, 24(6), S221-236.

King AC, Frey-Hewitt B, Dreon DM, Wood PD. (1989). The effects of minimal intervention strategies on long-term outcomes in men. *Archives of International Medicine*, 149: 2741-46.

King AC, Haskell WL, Taylor B, Kraemer HC, DeBusk RF. (1991). Group- vs home-based exercise training in healthy older men and women. A community-based clinical trial. *Journal of the American Medical Association*, 266: 1535-1542.

King AC, Jeffery RW, Fridinger F, Dusenbury L, Provence S, Hedlund SA, Spangler K. (1995). Environmental and policy approaches to cardiovascular disease prevention through physical activity: Issues and opportunities. *Health Education Quarterly*, 22: 499-511.

King AC, Oman R, Brassington G, Bliwise D, & Haskell W. (1997). Moderate-intensity exercise and self-rated quality of sleep in older adults: A randomized controlled trial. *Journal of the American Medical Association*, 277, 32-37.

King AC, Rejeski WJ, Buchner DM. (1998). Physical activity interventions targeting older adults: A critical review and recommendations. *American Journal of Preventive Medicine*, 15: 316-333.

King AC, Taylor CB, Haskell WL, et al. (1988). Strategies for increasing adherence to and long-term maintenance of home-based exercise training in healthy middle-aged men and women. *American Journal of Cardiology*, 61: 628-32.

Kirk D, Carlson T, O'Conner A, Burke P, Davis K, Glover S. (1997). The economic impact on families of children's participation in junior sport. *Australian Journal of Science and Medicine in Sport*, 29: 27-33.

Lachman M, Lewkowicz C, Marcus A, & Peng Y. (1994). Images of midlife development among young, middle-aged, and older adults. *Journal of Adult Development*, vol.1(4), 201-211.

Lampinen P, Heikkinen R-L, Ruoppila I. (2000). Changes in intensity of physical exercise as predictors of depressive symptoms among older adults: An eight-year follow-up. *Preventive Medicine*, 30: 371-380.

Landers DM, Petruzzello SJ. (1994). Physical activity, fitness and anxiety. In: Bouchard C, Shephard RJ, Stephens T (Eds). *Physical activity, fitness, and health: international proceedings and consensus statement*. Champaign, IL: Human Kinetics, pp.868-882.

Lau RR, Hartman KA. (1983). Common sense representations of common illnesses. *Health Psychology*, 2: 167-185.

Lauer RM, Lee J, Clarke WR. (1998). Factors affecting the relationship between childhood and adult cholesterol levels: The Mascutine Study. *Pediatrics*, 82: 309-318.

Lee C, Brown WJ. (1998). Australian migrant women and physical activity. *ACHPER Healthy Lifestyles Journal*, 45: 5-10.

Leighton D, Swerissen H. (1995). Correlates of vigorous physical activity in young adults during school transition. *Australian Psychologist*, 30: 113-118.

Leon AS, Blackburn H. (1983). Physical inactivity. In: Kaplan NM, Stamler JS (Eds.). *Prevention of Coronary Heart Disease. Practical Management of the Risk Factors*. Philadelphia: W.B. Saunders Company. 86-168

Leslie E, Bauman A, Salmon J, Veitch J, Sallis J. (1996). *Active Recreation on Tertiary Education Campuses: Phase 2 Report*. Melbourne: Deakin University.

Leslie E, Fotheringham MJ, Owen N, Bauman A. (in press, 2000). Age-related differences in physical activity levels of young adults. *Medicine and Science in Sports and Exercise*.

Leslie E, Fotheringham MJ, Veitch J, Owen N. (2000). A university campus physical activity promotion program. *Health Promotion Journal of Australia*, 10: 50-54.

Leslie E, Owen N, Sallis JF. (1999). Inactive Australian College students' preferred activities, sources of assistance, and motivators. *American Journal of Health Promotion*, 13: 197-199.

Leslie E, Owen N, Salmon J, Bauman A, Sallis JF, Lo SK. (1999). Insufficiently active Australian college students: perceived personal, social, and environmental influences. *Preventive Medicine*, 28, 20-27.

Leslie ER, Mounsey SM, Owen N. (1998). University campuses as settings for health promotion: physical activity. *Health Promotion Journal of Australia*, 8:136-139.

Lester IH. (1994). Australia's food & nutrition. *Canberra:AGPS 203-212*.

Linenger JM, Chesson CV, Nice S. (1991). Physical fitness gains following simple environmental change. *American Journal of Preventive Medicine*, 7: 298-310.

Lombard DN, Lombard TN, Winett RA. (1995). Walking to meet health guidelines: The effect of prompting frequency and prompt structure. *Health Psychology*, 14: 164-170.

Lord SR, Caplan GA, Ward JA. (1993). Balance, reaction time and muscle strength in exercising and non exercising older women. *Archives of Physical Medical Recreation*, 74: 837-839.

Lord SR, Ward JA, Williams P.(1995).The effect of a 12-month exercise trial on balance, strength and falls in older women: a randomized controlled trial. *Journal of Ageing and Geriatrics*, 44:489-497.

Lovato CY, Green LW. (1990). Maintaining employee participation in workplace health promotion programs. *Health Education Quarterly*, 17: 73-88.

Luepker RV, Murray DM, Jacobs DR, et al. (1994). Community education for cardiovascular disease prevention: Risk factor changes in the Minnesota Heart Health Program. *American Journal of Public Health*, 84: 1383-1393.

Luepker RV, Perry CL, McKinlay SM, Nader PR, Parcel GS, Stone EJ, Webber LS, Elder JP, Feldman HA, Johnson CC, Kelder SH, Wu M. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity. The Child and Adolescent Trial for Cardiovascular Health (CATCH). *Journal of the American Medical Association*, 275: 768-776.

Lytle LA, Kelder SH, Perry CL, & Klepp K-I. (1995). Covariance of adolescent health behaviors: the class of 1989 study. *Health Education Research*, 10(2), 133-146.

MacDougall C, Cooke R, Owen N, Willson K & Bauman A. (1997). Relating physical activity to health status, social connections and community facilities. *Australian and New Zealand Journal of Public Health*, 21(6):631-7.

Manios Y, Kafatos A. (1999). Health and nutrition education in elementary schools: Changes in health knowledge, nutrient intakes and physical activity over a six year period. *Public Health Nutrition*, 2: 445-448.

Manios Y, Moschandreas J, Hatzis C, Kafatos A. (1999). Evaluation of a health and nutrition education program in primary school children of Crete over a three-year period. *Preventive Medicine*, 28: 149-159.

Marcus BH, Bock BC, Pinto BM, Forsyth LH, Roberts MB, Traficante RM. (1998). Efficacy of an individualized, motivationally-tailored physical activity intervention. *Annals of Behavioral Medicine*, 20: 174-180.

Marcus BH, Eaton CA, Rossi JS, et al. (1994). Self-efficacy, decision making, and stages of change: An integrative model of physical exercise. *Journal of Applied Social Psychology*, 24: 489-508.

Marcus BH, Emmons KM, Simkin-Silverman LR, Linnan LA, Taylor ER, Bock BC, Roberts MB, Rossi JS, Abrams DB. (1998). Evaluation of motivationally tailored vs. standard self-help physical activity interventions at the workplace. *American Journal of Health Promotion*, 12: 246-253.

Marcus B, Goldstein M, et al. (1997). Training physicians to conduct physical activity counselling. *Preventive Medicine*, 26: 382-388.

Marcus BH, Nigg C, Reibe D, Forsyth LH. (2000). Interactive communication strategies: Implications for population-based physical activity promotion. *American Journal of Preventive Medicine*, 18:

Marcus BH, Owen N, Forsyth LH, Cavill NA, Fridinger F. (1998). Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventive Medicine*, 15: 362-378.

Marcus BH, Stanton AL. (1994). Evaluation of relapse prevention and reinforcement interventions to promote exercise adherence in sedentary females. *Research Quarterly for Exercise and Sport*, 64: 447-52.

Marlatt GA, Gordon JR. (Eds.). (1985). *Relapse prevention*. New York, Guilford.

Martinsen EW, Stephens T. (1994). Exercise and mental health in clinical and free-living populations. In: Dishman RK. (Ed.). *Advances in Exercise Adherence*. Champaign, Illinois: Human Kinetics. 55-72.

Mattarazzo JD, et al. (Eds.). (1984). *Behavioral health: A handbook of health enhancement and disease prevention*. New York: Wiley.

- McAuley E. (1994). Physical activity and psychosocial outcomes. In: Bouchard C, Shephard R, Stephens T (Eds). *Physical activity, fitness, and health: international proceedings and consensus statement*. Champaign, IL:Human Kinetics, p.551-68.
- McAuley E, Rudolph D. (1995). Physical activity, ageing, and psychological well-being. *Journal of Ageing and Physical Activity, 3:67-96*.
- McCallum M. (1990). Factors influencing the implementation of corporate fitness programs. *Journal of the Canadian Association for Health, Physical Education and Recreation, 56: 20-26*.
- McKenzie TL, Marshall SJ, Sallis JF, Conway TL. (2000). Leisure-time physical activity in school environments. *Preventive Medicine, 30: 70-77*.
- McKenzie TL, Nader PR, Strikmiller PK, Yang M, Sonte EJ, Perry CL, Taylor WC, Epping JN, Feldman HA, Luepker RV, Kelder SH. (1996). School physical education: Effect of the Child and Adolescent Trial for Cardiovascular Health. *Preventive Medicine, 25: 423-431*.
- McKenzie TL, Sallis JF, Kolody B, Faucette FN. (1997). Long-term effects of a physical education curriculum and staff development program: SPARK. *Research Quarterly for Exercise and Sport, 68: 280-291*.
- McLeroy KR, Bibeau D, Steckler A, Glanz K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly, 15: 351-377*.
- Medland A, Taggart A. (1997). The implementation of a health-related fitness intervention: A case study of two primary schools. *ACHPER Health Lifestyles Journal, 44: 9-15*.
- Miller P, Wikoff R, Hiatt A. (1992). Fishbein's model of reasoned action and compliance behaviour of hypertensive patients. *Nursing Research, 41: 104-109*.
- Moon AM, Mullee MA, Rogers L, Thompson RL, Speller V, Roderick P. (1999). Helping schools to become health-promoting environments: An evaluation of the Wessex Healthy Schools award. *Health Promotion International, 14: 111-122*.
- Moore M. (1982). Endorphins and exercise: A puzzling relationship. *Physician and Sportsmedicine, 10: 111-114*.
- Montaño DE, Kasprzyk D, Taplin SH. (1996). The theory of reasoned action and the theory of planned behaviour. In: Glanz K, Lewis FM, Rimer BK. (Eds.). *Health behaviour and health education: Theory, research, and practice*. 2nd Edition. San Francisco: Jossey-Bass, 85-112.
- Montoye HJ, Kemper HCG, Saris WHM, Washburn RA. (1996). *Measuring physical activity and energy expenditure*. Champaign, IL: Human Kinetics.
- Morris JN, Heady JA, Raffle PAB, Roberts CG, Parks JW. (1953). Coronary heart-disease and physical activity of work. *Lancet, 1053-1057*.

Moses J, Steptoe A, Mathews A, Edwards S. (1989). The effects of exercise training on mental well-being in the normal population: a controlled trial. *Journal of Psychosomatic Research*; 33:47-61.

Mullen P, et al., (1995). Settings as an important dimension in health education/promotion policy, programs and research. *Health Education Quarterly*, 22(3):329-345.

Napolitano MA, Marcus BH, Tate D, Sciamanna C, Fotheringham MJ, Owen N. *Who Responds to Web-based Physical Activity and Weight Loss Programs?* Society of Behavioral Medicine, Annual Meeting, Nashville, TN, April 5-8, 2000.

National Health and Medical Research Council (NHMRC). (1997). *Acting on Australia's weight: A strategic plan for the prevention of overweight and obesity*. Canberra, Australia: Australian Government Publishing Service.

National Heart Foundation (1999). *Policy statement and recommendations relating to physical activity*. National Heart Foundation.

National Institutes of Health (NIH) Consensus Development Panel on Physical Activity and Cardiovascular Health. (1996). Physical activity and cardiovascular health. *Journal of the American Medical Association*, 276: 241-246.

National Strategy for Health Promoting School. (1997). *Effective school health promotion: Towards health promotion schools*. Canberra: Australian Government Publishing Service.

Nevitt MC, Cummings SR, Kidd S, Black D. (1989). Risk factors for recurrent nonsyncopal falls: A prospective study. *Journal of the American Medical Association*, 261: 2663-2668.

Niknian M, Linnan L, Lasater T, Carleton R. (1991). Use of population based data to assess risk factor profiles of blue and white collar workers. *Journal of Occupational Medicine*, 33: 29-36.

NSW Health. (1996). *Physical Activity and Health: A special communication from the Chief Health officer*. Publication No. (HP) 950129 ISBN 0 7310 0745 X. Sydney, NSW: NSW State Health.

Nutbeam D, Wise M, Bauman A. (1993). *Goals and targets for Australia's health in the year 2000 and beyond. Report prepared for the Commonwealth Department of Health, Housing and Community Services*. Canberra: Australian Government Publishing Service.

O'Connor P, Bryant C, Veltri J & Gebhardt S (1993). State anxiety and ambulatory blood pressure following resistance exercise in females. *Medicine and Science in Sports and Exercise*, 25, 516-521.

O'Connor P, & Youngstedt S. (1995). Influence of exercise on human sleep. *Exercise and Sports Sciences Reviews*, 23, 105-134.

O'Dea K. (1984). Marked improvements in the carbohydrate and lipid metabolism in diabetic Australian Aboriginies following temporary reversion to traditional lifestyles. *Diabetes*, 33:596-603.

O'Dea K, Trainedes K, Ireland P, et al. (1989). The effect of diets differing in fat, carbohydrate and fibre on carbohydrate and lipid metabolism in type 2 diabetics. *J Am Dietetic Assoc*,89:1076-1086.

O'Dea K.(1991). Westernisation, insulin resistance and diabetes in Australian Aboriginies. *The Medical Journal of Australia*, 155:258-264.

Osler M, Jespersen NB. (1993). The effect of a community-based cardiovascular disease prevention project in a Danish municipality. *Danish Medical Bulletin*, 40: 483-489.

Ottawa Charter. (1986). *Ottawa Charter for Health Promotion*. Ottawa, Canada: World Health Organisation.

Owen H, Scullion P, Day R. (2000). *Attitudes to cycling and walking in Adelaide's hospitals - Why aren't our hospitals promoting healthy transport?* Adelaide: Bicycle Institute of South Australia. <http://www.bisa.asn.au/hospreport/>

Owen N. (1994). Shaping policies and programs to promote physical activity. In: Killorna A, Fenten P, Caspersen C. (Eds.). *Moving on: Implementing the physical activity goals for England*. London: UK Health Education Authority.

Owen N, Bauman A. (1992). The descriptive epidemiology of a sedentary lifestyle in adult Australians. *International Journal of Epidemiology*, 21: 305-310.

Owen N, Bauman A, Booth M, Oldenburg B, Magnus P. (1995). Serial mass-media campaigns to promote physical activity: Reinforcing or redundant? *American Journal of Public Health*, 85: 244-248.

Owen N, Crawford D. (1998). Health promotion: Perspectives on physical activity and weight control. In: Johnston M, Johnston D. (Eds.). *Health psychology*. London: Pergamon.

Owen N, Lee C. (1989). Development of behaviorally-based policy guidelines for the promotion of exercise. *Journal of Public Health Policy*, 10: 43-61.

Owen N, Lee C, Naccarella L, et al. (1987). Exercise by mail. *Journal of Sports Psychology*, 9: 346-57.

Owen N, Leslie E, Salmon J, Fotheringham M. (in press, 2000). Environmental determinants of physical activity and sedentary behavior. *Exercise and Sports Sciences Reviews*.

Paffenbarger RS, Hale WE. (1975). Work activity and coronary heart mortality. *New England Journal of Medicine*, 292: 545-550.

- Paffenbarger RS, Hyde RT, Wing AL, Hsieh C-C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine*, 314: 605-613.
- Pangrazi R. (2000) Promoting physical activity for youth. *Journal of Science and Medicine in Sport*, 3(3): 280-286.
- Pangrazi P, Corbin C, Welk G. (1997). Physical activity for children and youth. *CAHPERD Journal*, 4-7.
- Parcel GS, Simons-Morton BG, Hara NM, Baranowski T, et al (1987). School promotion of healthful diet and exercise behaviour. An integration of organisational change and social learning. *Journal of School Health*, 57(4):150-156.
- Pate R. (1995). Promoting activity and fitness. In: Cheung L, & Richmond J. (Eds). *Child health, nutrition and physical activity*, Human Kinetics, Champaign IL: 143-44.
- Pate R, Pratt M, Blair S, Haskell W, et al. (1995). Physical Activity and Public Health. A recommendation from the Centres for Disease Control and Prevention and the American College of Sports Medicine. *Journal American Medical Association*, 273: 402-407.
- Pavlou KN, Krey S, Steffee WP. (1989). Exercise as an adjunct to weight loss and maintenance in moderately obese subjects. *American Journal of Clinical Nutrition*, 49: 1115-1123.
- Pelletier K. (1996). A review and analysis of the health and cost effectiveness outcomes studies of comprehensive health promotion and disease prevention programs at the worksite. *American Journal of Health Promotion*, 10: 380-388.
- Pelletier KR. (1999). A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1995-1998 update (IV). *American Journal of Health Promotion*, 13: 333-345.
- Pender NJ. (1987). *Health promotion in nursing practice*. 2nd Edition. Norwalk, CT: Appleton and Lange.
- Perkins E. (1999). Current approaches to gathering evidence. In: Perkins E, Simnett I, Wright L. (Eds). (1999). *Evidence-based health promotion*. England:John Wiley & Sons. p.35.
- Perry CL, Baranowski T, Parcel GS. (1990). How individuals, environments, and health behavior interact: Social learning theory. In: Glanz K, Lewis FM, Rimer BK. (Eds.). (1990). *Health behaviour and health education: Theory, research, and practice*. San Francisco: Jossey-Bass. 161-186.
- Perry CL, Klepp KI, Halper A. (1987). Promoting healthy eating and physical activity patterns among adolescents: A pilot study of "Slice of Life". *Health Education Research*, 1: 93-103.

Plotkinoff R, Williams P, Higginbotham N. (1996). An evaluation of the Kurri Kurri public school healthy heartbeat project. *ACHPER Healthy Lifestyles Journal*, 43: 21-25.

Prentice AM, Jebb SA. (1995). Obesity in Britain: gluttony or sloth? *British Medical Journal*, 311: 437-439.

Prochaska JJ, Zabinski MF, Calfas K, Sallis JF, Patrick K. (2000). PACE+: Interactive communication technology for behavior change in clinical settings. *American Journal of Preventive Medicine*, 18:

Prochaska JO, DiClemente CC. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51: 390-395.

Prochaska JO, Marcus BH. (1994). The transtheoretical model: Applications to exercise. In: Dishman RK (Ed.), *Advances in Exercise Adherence*. Illinois: Human Kinetics. 161-180

Prochaska JO, Velicer WF, Rossi JS, et al. (1994). Stages of change and decisional balance for 12 problem behaviours. *Health Psychology*, 13: 39-46.

Province MA, Hadley EC & Hornbrok MC. (1995). The effects of exercise on falls in elderly patients. A pre-planned meta-analysis of the FICSIT trials. *Journal of the American Medical Association*, 273:1341-1347.

Public Health Association of Australia (PHAA). (1999). *Policy statements 1999*. Canberra: Public Health Association of Australia

Public Health Association of Australia. (1998). *Recommendations for increasing physical activity in the population*. Canberra: Public Health Association of Australia.

Quinney HA, Gauvin L, Wall A. (Eds.). (1992). *The active living concept: Critical analysis and challenges for the future*. Toward Active Living. Proceedings of the International Conference on Physical Activity, Fitness and Health. Campaign Illinois, Human Kinetics. 269-289.

Rachlin H. (1989). *Judgement, decision, and choice: a cognitive / behavioral synthesis*. New York: WH Freeman.

Raitakari OT, Leino M, Raikonen K, Porkka KVK, Taimela S, et al. (1995). Clustering of risk habits in young adults: The cardiovascular risk in Young Finns study. *American Journal of Epidemiology*, 142: 36-44.

Raitakari OT, Porkka KVK, Taimela S, Telama R, et al. (1994). Effects of persistent physical activity and inactivity on coronary risk factors in children and young adults: The cardiovascular risk in young Finns study. *American Journal of Epidemiology*, 140: 195-205.

Ransford CP. (1982). A role for amines in the antidepressant effect of exercise: A review. *Medicine and Science in Sports and Exercise*, 14: 1-10.

Reid D. (1996). How effective is health education via mass communications? *Health Education Journal*, 55: 332-344.

Rejeski WJ, Thompson A, Brubaker PH & Miller HS., (1992). Acute exercise: Buffering psychosocial stress responses in women. *Health Psychology*, 11, 355-362.

Resincow K, Robinson TM. (1997). School based cardiovascular disease prevention studies: Review and synthesis. *Annals of Epidemiology*, 57: 514-531.

Ried LD, Christensen DB. (1988). A psychosocial perspective in the explanation of patients' drug taking behaviour. *Social Science and Medicine*, 27: 277-285.

Rippetoe PA, Rogers RW. (1987). Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. *Journal of Personality and Social Psychology*, 52: 596-604.

Roberts, A. (1982). *Life: Be In It. Health and fitness*. Department of Youth, Sport and Recreation.

Roberts K, Dench S, Minten J, York C. (1989). *Community response to leisure centre provision in Belfast*. London, UK: Sports Council.

Robinson TN. (1999). Reducing children's television viewing to prevent obesity. *Journal of the American Medical Association*, 282: 1561-1567.

Robinson TN, Killen JD. (1995). Ethnic and gender differences in the relationships between television viewing and obesity, physical activity, and dietary fat intake. *Journal of Health Education*, 26: S91-S98.

Rosenstock IM, Kirscht JP. (1974). The health belief model and personal health behaviour. *Health Education Monographs*, 2: 470-473.

Rosenstock IM. (1990). The health belief model: Explaining health behaviour through expectancies. In: Glanz K, Lewis FM, Rimer BK. (Eds.). *Health behaviour and health education: Theory, research, and practice*. San Francisco: Jossey-Bass, 39-62.

Rossi JS, Rossi SR, Velicer WF, et al. (1995). Motivational readiness to control weight. In: Allison DB. (Ed.). *Handbook of assessment methods for eating behaviours and weight-related problems: Measures, theory, and research*. Thousand Oaks, CA: Sage, 387-430.

Rowland, TW. (1990). *Exercise and children's health*. Champaign, Illinois: Human Kinetics Books.

Rutenfranz J, Ilmarinen J, Klimmer F and Kylian H. (1990). Work load and demanded physical performance capacity under different industrial working conditions. In: Kaneko M. (Ed.). *Fitness for the Aged, Disabled, and Industrial Worker*. Champaign, IL: Human Kinetics, 217-238.

Sallis JF. (in press). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and Science in Sports and Exercise*.

Sallis JF, Bauman A, Pratt M. (1998). Environmental and policy interventions to promote physical activity. *American Journal of Preventive Medicine*, 15: 379-397.

Sallis JF, Calfas KJ, Nichols JF, Sarkin JA, Johnson MF, Caparosa S, Thompson S, Alcaraz JE. (1999). Evaluation of a university course to promote physical activity: Project GRAD. *Research Quarterly in Exercise and Sport*, 70: 1-10.

Sallis JF, Hovell MF. (1990). Determinants of exercise behaviour. *Exercise and Sport Sciences Reviews*, 18, 307-30.

Sallis JF, Hovell MF, Hostetter CR. (1992). Predictors of adoption and maintenance of vigorous physical activity in men and women. *Preventive Medicine*, 21: 237-251.

Sallis JF, Hovell MF, Hostetter CR. et al., (1990). Distance between homes and exercise facilities related to the frequency of exercise among San Diego residents. *Public Health Reports*, 105: 179-85.

Sallis JF, McKenzie TL, Alcaray JE, Kolody B, Faucette N, Hovell MF. (1997). The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *American Journal of Public Health*, 87: 1328-1334.

Sallis JF, Owen N. (1996). Ecological Models. In: Glanz K, Lewis FM, Rimer BK. (Eds.). *Health behaviour and health education: Theory, research, and practice*. 2nd Edition. San Francisco: Jossey-Bass. 403-424.

Sallis JF, Owen N. (1999). *Physical activity and behavioral medicine*. Thousand Oaks, CA: Sage.

Sallis JF, Patrick K. (1994). Physical activity guidelines for adolescents: Consensus statement. *Pediatric Exercise Science*; 6: 302-314.

Sallis JF, Saelens BE. (in press). Assessment of Physical Activity by Self-Report: status, limitations, and future directions. Paper for CIAR Conference, "Measurement of Physical Activity", Dallas, Texas.

Salmon JL. (2000). *Leisure-time physical activity, inactivity and sedentary behaviours*. Unpublished Doctoral Dissertation, Deakin University, Melbourne, Australia.

Salmon J, Owen N, Bauman A, Schmitz MKH, Booth M. (2000). Leisure-time, occupational, and household physical activity among professional, skilled, and less-skilled workers and homemakers. *Preventive Medicine*, 30: 191-199.

Saltzer EB. (1978). Locus of control and intention to lose weight. *Health Education Monographs*, 6: 118-128.

Saris WHM. (1998). Fit, fat and fat free: The metabolic aspects of weight control. *International Journal of Obesity*, 22: S15-S21.

Saxon L, Finch C & Bass S. (1999). Sports participation, sports injuries and osteoarthritis. *Sports Medicine*, 28(2): 123-135.

Schmid TL, Pratt M, Howze E. (1995). Policy as intervention: environmental and policy approaches to the prevention of cardiovascular disease. *American Journal of Public Health*, 85: 1207-1211.

Science Panel on Interactive Communication and Health (SPICH). (1999). *Wired for health and well-being: The emergence of interactive health communication*. Washington, DC: US Department of Health and Human Services, US Government Printing Office.

Shepard RJ. (1996). Worksite fitness and exercise programs: A review of methodology and health impact. *American Journal of Health Promotion*, 10: 436-452.

Shephard RJ (1997). Aging, physical activity, and health. Human Kinetics, Champaign IL, USA.

Shepard RJ, Bouchard C. (1996). Associations between health behaviours and health related fitness. *British Journal of Sports Medicine*, 30: 94-101.

Sidney S, Sternfeld B, Haskell WL, Jacobs DR, Chesney MA, Hulley SB. (1996). Television viewing and cardiovascular risk factors in young adults: The CARDIA Study. *Annals of Epidemiology*, 6: 154-159.

Simoës EJ, Byers T, et al. (1995). The association between leisure-time physical activity and dietary fat in American adults. *American Journal of Public Health*, 85: 240-244.

Simons-Morton DG, Kalfas KJ, Oldenburg B, Burton NW. (1998). Effects of interventions in health care settings on physical activity or cardiorespiratory fitness. *American Journal of Preventive Medicine*, 15: 413-430.

Simons-Morton BG, Parcel GS, Baranowski T, Forthofer R, O'Hara NM. (1991). Promoting physical activity and a healthful diet among children: Results of a school-based intervention study. *American Journal of Public Health*, 81: 986-991.

Skelton JA, Croyle RT. (1991). Mental representations in health and illness, New York: Springer-Verlag.

Smith JR, Owen N, Leslie E, Bauman A. (1999). *Active For Life: Physical Activity Patterns and Health Impacts in Victoria 1998*. Melbourne, Victoria: Victorian Department of Human Services.

SPARC (1997). *Be Active School Community (BASC) project: Evaluation report*. Perth: Edith Cowan University.

Spiriduso W. (1995). *Physical dimensions of aging*. Champaign, Illinois: Human Kinetics.

Sports Medicine Australia (SMA). (1999). *National Public Health Committee Philosophy Document*. Canberra: Sports Medicine Australia.

Stephens T. (1988). Physical activity and mental health in the United States and Canada: evidence from four population surveys. *Preventive Medicine, 17:35-47*

Stephens T. (1990). Discussion: Behavioural adaptation to physical activity. *Exercise, fitness, and health*

Stephens T, Craig CL. (1990). *The well-being of Canadians: Highlights of the 1988 Campbell's Survey*. Ottawa: Canadian Fitness and Lifestyle Research Institute.

Steptoe A, Wardle J, Fuller R, Holte A, Justo J, Sanderman R, Wichstrom L. (1997). Leisure-time physical exercise: prevalence, attitudinal correlates, and behavioral correlates among young Europeans from 21 countries. *Preventive Medicine, 26: 8845-854*.

Stewart AL, Hays RD, Wells KB, Rogers WH, Spritzer KL, Greenfield S. (1994). Long-term functioning and well-being outcomes associated with physical activity and exercise patients with chronic conditions in the Medical Outcomes Study. *Journal of Clinical Epidemiology, 47:719-730*.

Stokols D. (1992). Establishing and maintaining healthy environments: toward a social ecology of health promotion. *American Psychologist, 47: 6-22*.

Stokols D, Allen J, Bellingham RL. (1996). The social ecology of health promotion: implications for research and practice. *American Journal of Health Promotion, 10: 247-251*.

Stone EJ, McKenzie TL, Welk GJ, Booth ML. (1998). Effects of physical activity intervention in youth: Review and synthesis. *American Journal of Preventive Medicine, 15: 298-315*.

Strychar IM, Potvin L, Pineault R, Pineau R, Prevost D. (1994). A supermarket cardiovascular screening program: analysis of participants' solicitation of follow-up care. *American Journal of Preventive Medicine, 10: 283-289*.

Swinburn B, Egger G, Raza F. (1999). Dissecting obesogenic environments: The development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Preventive Medicine, 29: 563-570*.

Swinburn B, Walter LG, Arroll B, Tilyard MW, Russell DG. (1998). The green prescription study: A randomized controlled trial of written exercise advice provided by general practitioners. *American Journal of Public Health, 88*: 288-291.

Taylor HL, Klepetar E, Keys A, Parlin W, Blackburn H, Puchner T. (1962). Death rates among physically active and sedentary employees of the railroad industry. *American Journal of Public Health, 52*: 1697-1707.

Taylor WC, Baranowski T, Young DR. (1998). Physical activity interventions in low-income, ethnic minority, and populations with disability. *American Journal of Preventive Medicine, 15*: 334-343.

Taylor W & Sallis J. (1997). Determinants of physical activity in children. In: Simopoulos A, Pavlou K (Eds). *Nutrition and fitness: Metabolic and behavioural aspects in health and disease*. World Rev Nutr Diet. Basel, Karger, 82:159-167.

Terry DJ, Gallois C, McCamish M. (Eds.). (1993). *The theory of reasoned action: Its application to AIDS-preventive behaviour*. Oxford: Pergamon.

Toda A, Okuni M. (1987). Tracking of blood lipids in school age children. *Journal of the Japanese Pediatric Society, 91*: 3245.

Tolman A. (1938). The determinants of behaviour at a choice point. *Psychological Review, 45*: 1-41.

Trewin D. (1997). *Australian transport and the environment*. Canberra: Australian Government Publishing Service.

Trotter L. (1998). Tobacco health warnings: Longitudinal evaluation of effects on recall and smoking related behaviours. In: Trotter L, Mullins R (Eds). *Quit Evaluation Studies, Volume 9*. Carlton South, Victoria: Centre for Behavioural Research in Cancer, 133-142.

Tucker L. (1986). The relationship of television viewing to physical fitness and obesity. *Adolescence, 21*: 780-806.

Tucker L, Friedman GM. (1989). Television viewing and obesity in adult males. *American Journal of Public Health, 79*: 516-518.

US Department of Health and Human Services (US DHHS). (1996). *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

US Surgeon General. Preventing Tobacco Use among Young People. NIH (1994).

- Valois P, Desharnais R, Godin, G. (1988). A comparison of the Fishbein and Ajzen and the Triandis attitudinal models for prediction of exercise intention and behavior. *Journal of Behavioral Medicine*, 11: 459-472.
- van Kemenade T, Maes S, van den Broek Y. (1994). Effects of a health education programme with telephone follow-up during cardiac rehabilitation. *British Journal of Clinical Psychology*, 33: 367-378.
- Veitch J, Burn J, Owen N, Sallis J. (1997). Physical activity promotion for male factory workers: A realistic option. *Health Promotion Journal of Australia*, 7: 169-174.
- Veitch J, Clavisi O, Salmon J, Owen N. (1998). *Healthy activity for working men*. Melbourne: Deakin University (unpublished report).
- Veitch J, Salmon J, Clavisi O, Owen N. (1999). Physical inactivity and other health risks among Australian males in less skilled occupations. *International Journal of Occupational and Environmental Medicine*, 41: 794-798.
- VicHealth (1999). *Mental Health Promotion Plan 1999-2002*. Melbourne: VicHealth.
- VicHealth (1999). *Strategic Directions 1999-2002: Promoting a State of Health*. Melbourne: VicHealth.
- Victorian Department of Human Services (1999). *Active for Life: Promoting physical activity in Victoria – an integrated cross sectional strategy*. Melbourne, Victoria.
- Victorian Smoking and Health Program (1995). *Tobacco in Australia: Facts and issues*. 2nd Edition. Carlton South, Victoria: Victorian Smoking and Health Program.
- Vuchinich RE, Tucker JA. (1987). Contributions from behavioral theories of choice to an analysis of alcohol abuse. *Journal of Abnormal Psychology*, 97: 181-195.
- Vuori IM, Oja P, Paronen O. (1994). Physically active commuting to work - testing its potential for exercise promotion. *Medicine and Science in Sports and Exercise*, 26: 844-850.
- Wallack L. (1990). Media advocacy: Promoting health through mass communication. In: Glanz K, Lewis FM, Rimmer B, (Eds.). *Health behavior and health education: Theory, research and practice*. San Francisco, CA: Jossey-Bass. 370-386.
- Wankel LM, Sefton JM. (1994). Physical activity and other lifestyle behaviours. In: Bouchard C, Shephard RJ, Stephens T (Eds.), *Physical activity, fitness, and health*. Champaign, Illinois: Human Kinetics. 530-550.
- Wattigney WA, Webber LS, Srinivasan SR, Berensen GS. (1995) The emergence of clinically abnormal levels of cardiovascular risk factor variables among young adults. The Bogalusa Heart Study. *Preventive Medicine*, 24: 617-626.

Webber LS, Srinivasan SR, Berenson GS. (1998). Tracking of serum lipids and lipoproteins over 12 years into young adulthood. The Bogalusa Heart Study. *Circulation*, 78(supp 2): 481. [Abstract].

Weinstein ND, Rothman AJ, Sutton R. (1998). Stage theories of health behaviour: Conceptual and methodological issues. *Health Psychology*, 17: 1-10.

Weller I, Corey P. (1998). The impact of excluding non-leisure energy expenditure on the relation between physical activity and mortality in women. *Epidemiology*, 9: 632-635.

Weschler H, Rigotti NA, Gledhill-Hoyt J, Lee H. (1998). Increased levels of cigarette use among college students: a cause for national concern. *Journal of the American Medical Association*, 280(19), 1673-1678.

Western Australian Schools Physical Activity and Nutrition Project (WASPAN). (1991). *WASPAN teachers manual*. Perth: University of Western Australia.

Wilfrey DE, Brownell KD. (1994). Physical activity and diet in weight loss. In: Dishman RK. (Ed.). *Advances in Exercise Adherence*. Champaign, Illinois: Human Kinetics. 361-394.

Williams CL. (1994). Coronary Heart Disease prevention in childhood Part 1: Background and Rationale. *Medicine, Exercise, Nutrition and Health*, 3: 194-205.

Williams P & Lord S. (1997). Effects of group exercise on cognitive functioning and mood in older women. *Australian and New Zealand Journal of Public Health*, 21:45-52

Williams P, Plotnikoff R. (1995). The Kurri Kurri public school healthy heartbeat project. *Health Promotion Journal of Australia*, 5: 35-39.

Wimbush E, MacGregor A, Fraser E. (1998). *The effects of a national mass media campaign on walking in Scotland*. Health Promotion International.

Wiseman MJ. (1996). Behaviour change in practice: population strategies. *International Journal of Obesity*, 20(Supp 1): S31-S33.

Wolf S, Barnhardt H, & Kutner N. (1996). Reducing frailty and falls in older persons: an investigation of Tai Chi computerised balance training. *Journal of Ageing and Geriatrics*, 44:489-497.

Women's Health Australia. (1997). *Data book for the baseline survey of the Australian longitudinal study on women's health*. University of Newcastle.

World Health Organisation (WHO). (1997). *Obesity: Preventing and managing the global epidemic*. Geneva: World Health Organisation.

Wright C, McDougall C, Atkinson R, Booth B. (1996). *Exercise in daily life: Supportive environments*. Adelaide: South Australian Health Commission.

Young M, Fricker P, Thomson N, Lee A. (1999). Sudden death due to ischaemic heart disease in young Aboriginal sportsmen in the Northern Territory, 1982-1996. *Medical Journal of Australia*, 170:425-428.

Young DR, Haskell WL, Taylor CB, Fortmann SP. (1996). Effect of community health education on physical activity knowledge, attitudes, and behavior: The Stanford five-city project. *American Journal of Epidemiology*, 144: 264-274

WEBSITES CITED

Active Australia website: <http://www.ausport.gov.au/partic/>

ASSO website: <http://www.med.monash.edu.au/medicine/mmc/asso/>

Moneghetti Report: <http://www.sofweb.vic.edu.au/physed>

NHF website: <http://www.heartfoundation.com.au>.

PHA website: <http://www.phaa.net.au>.

SMA website: <http://www.sma.org.au>

VicHealth website: <http://www.vichealth.vic.gov.au>

APPENDIX A: EVALUATION OF PHYSICAL ACTIVITY PROMOTION STRATEGIES

There are a number of key outcomes or criteria that can be assessed to evaluate the effectiveness of strategies to promote physical activity. These criteria are outlined below. It is important to consider and build in the appropriate evaluation criteria when developing or planning initiatives to promote physical activity. The inclusion of appropriate evaluation tools enables adequate evaluation of the effectiveness of the physical activity promotion approach/es used.

- Increased physical activity behaviour (measured as time spent, or energy expenditure) either at the individual or population level (eg, the proportion of those meeting the National Physical Activity Guidelines)
- Morbidity/ mortality (eg, overweight/obesity, CHD, NIDDM, osteoporosis, colon cancer)
- Changes in physiological parameters (eg, cardiovascular fitness, adiposity, body mass index, blood lipids, blood pressure, flexibility, strength, functional fitness)
- Changes in awareness, knowledge, attitudes, motivational readiness
- Changes in psychological/cognitive parameters (eg, decisional balance, self-efficacy, barriers)
- Policy audits (eg, audit of physical activity policies at Commonwealth, State, local government, communities, workplaces, and schools)
- Evidence of intersectoral partnerships (eg, partnership between community action group, local government, and urban planning)
- Evidence of dissemination to relevant agencies and key stake holders
- Environmental audits (eg, number of facilities, walking and bicycle tracks)
- Environmental changes (eg, new physical activity facilities, walking tracks)
- Changes in perceptions of the physical activity environment
- Changes in the use of facilities (eg, monitoring of park usage)
- Expenditure on physical activity (eg, clothing, equipment, memberships/fees, video and other self-help materials)
- Allocation of research grant and promotional funds from philanthropic trusts, government and private health organisations
- Media coverage/exposure

- Hits to physical activity/informational websites
- The number of physical activity journal articles and textbook publications
- Monitoring of television, computer, and electronic games use

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