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**National physical activity
recommendations for older
Australians:
Discussion Document**

Prepared for the
Australian Government
Department of Health and Ageing

**By the
National Ageing Research Institute**

This document has been prepared for the Department of Health & Ageing by members of the Public Health Division, National Ageing Research Institute: Jane Sims, Keith Hill, Sue Hunt and Betty Haralambous. We acknowledge the advice and feedback provided by the project's Expert Advisory Group members: Annette Brown, Lisa Engel, Nancy Huang, Ngaire Kerse and Marcia Ory.

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Glossary

ADL: Activities of daily living

Aged care staff: includes non-professional staff such as care assistants, and professional staff such as registered nurses, general practitioners, and allied health staff (for example: social workers, physiotherapists, diversional therapists, podiatrists, pastoral care workers, music therapists). Volunteers may provide aspects of care or play a role in supporting residents and/or their families.

AGREE: Appraisal of Guidelines Research and Evaluation

BMI: Body Mass Index

BP: Blood pressure

CATI: Computer assisted telephone interview

CHD: Coronary heart disease

CHF: Congestive heart failure

CI: Confidence interval

Clinical practice guidelines: Statements guiding the practice of health care practitioners that are developed from the collation and synthesis of the available evidence for the effective management of those with specific diseases or clinical conditions (National Health and Medical Research Council [NHMRC], 1999). These guidelines have the potential to aid in health care decision making and quality improvement, describe care that is fitting, and focus on particular circumstances while taking into account the specific care context.

Connectivity: The directness or ease of travel between two points that is directly related to the characteristics of street design.

COPD: Chronic obstructive pulmonary disease

CLDB (Culturally and linguistically diverse backgrounds): 'Persons born overseas in countries where English is not the main language spoken' (Gibson, Braun et al. 2001)pg 1.

CVD: Cardiovascular disease

DALYs: Disability adjusted life years

Delphi survey process: A technique used to elicit opinions with the goal of obtaining a group response from a panel of experts

FM: Fat mass

Geographical information systems: Computer based systems designed to integrate different types of spatial and attribute information. Data relevant to physical activity includes topography, geological feature, existing land uses, infrastructure systems, recreation facilities and residences

Hazard ratio: A statistical term describing the relative risk of a complication (eg colorectal cancer) based on comparison of event rates between two groups categorised by presence or absence of a predictor variable (eg previous physically active or not).

IHD: Ischemic heart disease

IRM: One repetition maximum – an indication of current muscle strength in a particular muscle group, used as a basis for determining the weight that should be lifted in a strength training program (usually a percentage of the 1RM).

Land-use mix is the level of integration within a given area of different types of uses for physical space, including residential, office, retail/commercial and public space.

LDL-cholesterol: low density lipoprotein cholesterol

Moderate level physical activities is physical activity at a level that causes your heart to beat faster and some shortness of breath, but that you can still talk comfortably while doing.

NHPA: National Health Priority Area

OA: Osteoarthritis

OR: Odds ratio

Primary, secondary and tertiary prevention: Primary, secondary and tertiary prevention refer to health promoting activity, early disease detection and management, and treatment of established disease respectively.

PRT: Progressive resistance training

PTSD: Post traumatic stress disorder

RCT: Randomised controlled trial

Residential aged care: The care provided for residents of aged care facilities. Residential Aged Care Facilities (RACFs), previously known as nursing homes and hostels, provide personal care, support services, allied health services, and accommodation for elderly people assessed by Aged Care Assessment Teams to be in need of such care and services. ACFs provide high level care, which includes 24-hour access to professional nursing care; low level care, where access to professional nursing care is more limited; or a combination of both high and low level care

Residential aged care worker: Any person providing care in a residential aged care facility. This term will cover professional staff, non-professional staff, and volunteers.

Residential density the number of dwellings per unit of land.

ROM: Range of motion

RR: Rate ratio

SEPA: Supportive Environments for Physical Activity

Definitions

'Older Australians' can be defined as the heterogenous group of older adults who are members of our society. The National Strategy for an Ageing Australia, with its four themes, aims to optimise independence and self provision amongst older Australians, promote positive attitudes, lifestyles and access to community support in order to enable healthy ageing and delivery of world class care, as required.

Although there are difficulties in ascribing a particular chronological age to define "older people", and while it is recognised that there is wide variability in health status, function and wellbeing at any age, *for the purposes of this document the term "older people" primarily refers to those aged over 65 years*. Chronological age was not the only criteria for consideration of the applicability of the evidence and recommendations in this document. Furthermore, many of the issues considered may have applicability for other age groups, for example, younger people with disability.

For Aboriginal and Torres Strait Islanders, the age of 55 years and above is used.

Ageing

'Ageing' of the individual in the strictest sense means growing old. It can also signify life-long growth and development in physical, economic, psychological cultural spiritual and other ways' (United Nations General Assembly 1995).

'Active ageing' is defined by the World Health Organisation as "the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age" (World Health Organisation 2002)(p 12).

'Successful ageing' is 'ones ability to maintain a physically healthy state, mental and physical functioning and social engagement' (Rowe and Kahn 1998).

The WHO Heidelberg guidelines (1997) identify three groups of older people along the health-fitness gradient: the physically fit-healthy; the physically unfit-unhealthy but independent living; and the physically unfit- unhealthy and dependent individuals. Within each of these categories, people may be either sedentary or physically active.

Physical activity

The US National Institutes of Health (NIH) Consensus Statement defined physical activity as

'any bodily movement produced by skeletal muscles that requires energy expenditure and produces progressive health benefits' (NIH, pg 3).

Physical activity encompasses exercise, which was defined as

'planned physical activity with bodily movements that are structured and repetitive, performed for the purpose of improving or maintaining physical fitness' (NIH, pg 3).

Bouchard and Shepard (1994) define physical activity more physiologically as 'any body of movement provided by skeletal muscles that results in a substantial increase over the resting energy expenditure. Under this broad rubric we consider active physical leisure, exercise, sport, occupational work and chores, together with other factors modifying the total daily energy expenditure' (pg 77).

Moderate level physical activities: Physical activity at a level that causes the heart to beat faster and some shortness of breath, but during which a person can still talk comfortably.

Vigorous physical activities: Physical activity at a level that causes the heart to beat a lot faster and shortness of breath that makes talking difficult between deep breaths (Glasgow, Ory et al. 2005).

Incidental physical activity

Incidental physical activity is unstructured activity taken during the day, such as walking for transport, housework and the performance of activities of daily living.

Sufficient physical activity

The term 'sufficient physical activity to produce health benefit' is found in the National Physical Activity Guidelines. 'Sufficient' is defined as 150 minutes or more of moderate and/or vigorous activity per week.

Aerobic or endurance exercise is defined as continuous movement involving large muscle groups that is sustained for a minimum of 10 minutes. (Pate, Pratt et al. 1995)

Physical disability, handicap and participation limitations

The International Classification of Impairment, Disability and Handicap (ICIDH) uses three classifications to describe the consequences of disease: impairments, disabilities and handicaps.

The ICIDH defines impairment as "a loss or abnormality of psychological or anatomical function". Impairment occurred at the level of the body organ.

Disability is defined as "any restriction or lack of ability to perform an activity in the manner considered to be normal for a human being" (World Health Organisation 2001). Disability occurs at the level of the individual.

Handicap is defined as "a disadvantage for a given individual from an impairment or disability that limits or prevents the fulfilment of a role that is 'normal' for that individual." Six roles considered central to social existence were identified by the ICIDH: orientation, physical independence, mobility, occupation, social integration and economic self-sufficiency. Handicap occurred at the level of society.

With regard to physical activity, the more recent ICIDH2 and the International Classification of Functioning, Disability and Health (ICF) definitions of participation are also relevant (World Health Organisation, 2001):

Participation describes an individual's involvement in life situations in relation to health conditions, body functions and structure, activities and contextual factors.

Participation restrictions are problems an individual may experience in involvement in life situations. Participation restriction is assessed by comparing the participation in life activity of persons with and without disability in that society. The classification of participation restriction is made by placing the observed involvement in a life activity in 1 of 9 participation domains that include: personal maintenance; mobility; exchange of information; social relationships; home life and assistance to others; education; work and employment; economic life; and community, social and civic life.

Mental disability

The Mental Health Act (2001) defines mental health as:

'A dynamic process in which a person's physical, cognitive, affective, behavioural and social dimensions interact functionally with one another and with the environment'.

The National Health Data Dictionary (version 11) defines mental disorder as 'disturbance of mood or thought that can affect behaviour and distress the person and those around them, so the person cannot function normally'.

People from culturally and linguistically diverse backgrounds

A range of definitions have been used to classify people of different ethnic and cultural backgrounds. For example, race is used to describe a biologically distinct group, with shared genetic patterns. In contrast, ethnicity relates to a culturally distinct group, who may share common culturally determined phenotypes, e.g. habits.

The term 'culturally and linguistically diverse backgrounds' (CLDB) was developed given the limitations of the term 'non-English speaking background'. There are many migrants who may speak English well, e.g. Singaporeans, Malaysians, Indians, yet have cultural backgrounds that can differ greatly from those of Anglo-Celtic Australians. In this document the Australian Institute of Health and Welfare's (AIHW) definition of older people from culturally and linguistically diverse backgrounds is used:

.. 'persons aged 65 or over, born overseas in countries where English is not the main language spoken' (Gibson, Braun et al. 2001) pg 1.

Executive Summary

Older people have much to gain from being physically active, given the potential benefits to mental and physical health and wellbeing (Bauman 2004). Older people are also more prone to adverse effects from medication: physical activity offers a useful, cost effective alternative to drug management in older people, reducing the need for medication. Recent national surveys show that the current physical activity status of older Australians leaves scope for improvement (Bauman 1997; Armstrong, Bauman et al. 2000). Only 43% of those aged 60 to 75 are sufficiently active to achieve health benefits (Armstrong, Bauman et al. 2000). Given their high level of absolute risk for mortality and a range of health problems, sedentary older people have the potential to benefit more than any other sector of the population from physical activity uptake and maintenance.

Physical activity can prevent the onset of chronic conditions and ameliorate the impact of chronic conditions. The current consensus is for a combination of moderate aerobic, strength, balance and flexibility exercises for older people (King, Pruitt et al. 2000) to decrease the impact of age related decline. The evidence for the benefits of exercise extends to frail older people (Fiatarone, O'Neill et al. 1994) both in the community and in residential aged care settings. For epidemiological evidence and that obtained from effectiveness studies to reach and impact on the health of older Australians, evidence needs to be translated into policies and practice.

The current national physical activity guidelines (Department of Health and Aged Care 1999) are intended for all Australians. Whilst they are generally relevant to older people, their non-specific nature means that there have been some reservations about their application to older people, from both consumers and health care providers. The Australian Government has responded by commissioning a review and the development of physical activity recommendations for older people. This work has been undertaken by the National Ageing Research Institute. These recommendations will complement the adult guidelines and those produced for other population sub-groups: children and young people (Trost 2005). With a range of health promotion and physical activity campaigns currently being rolled out at a national and state level, development of tailored recommendations is timely. Recommendations on physical activity for older Australians have the potential to optimise the uptake and maintenance of a range of evidence based physical activity programs currently available and to identify programs that may need further development and implementation for particular sub-groups of older people, especially those with complex comorbidities.

This document and the associated Recommendations will support the Australian Government Department of Health and Ageing in promoting the health of a growing sector of the population, to optimise the overall health of the nation. The work accords with the Australian Government's Healthy Ageing Strategy, the Be Active Australia: A Health Sector Framework for Action 2005-2010, the 'Better Health For All Australians' package recently announced by the Council of Australian Governments (February 2006) and a range of population health and chronic disease prevention and management frameworks or national action agendas, such as that of the National Obesity Taskforce (Department of Health and Ageing 2005). The recommendations will contribute to the evidence base for the National Health Priority Areas and the National Research Priority Area of Promoting and maintaining good health.

This document addresses physical activity for older people at three levels: individual, societal and structural. The evidence to date suggests that key elements at each level are:

- a) **Individual** : health status and disability, negative and positive beliefs e.g. perceptions of available time. Maintenance of physical activity needs strategies to sustain motivation and participation;
- b) **Societal**: addressing isolation, role models, community attitudes. Maintenance of physical activity needs strategies to provide social support;
- c) **Structural**: access to information and venues and tailored, safe options for all individuals and groups. Maintenance of physical activity needs strategies to promote enjoyable, affordable and accessible activities.

Where other countries have developed physical activity recommendations for older people, these have often been based upon consensus statements. The current draft recommendations have been derived from the evidence base using a systematic critiquing process.

The methodology for producing this discussion paper and recommendations for physical activity in older people consisted of four main components:

1. Scoping: A framework for the development of the paper and recommendations was produced for discussion by the expert advisory group and subsequently refined;
2. Literature review: The evidence was reviewed using approved national guidelines and a discussion document produced for consideration;
3. Formulation of recommendations: A series of recommendations were outlined, incorporating guidance relevant to sub-populations of older people and specific stakeholder groups involved in implementation. These were reviewed by the expert advisory group;
4. Refinement: The documents were refined in line with the feedback received from the expert advisory group. The refinement process also involved widespread national consultation, and focus groups with older people.

Current levels and trends of older peoples' physical activity participation in Australia were assessed in conjunction with contemporary data on determinants of older Australians' participation in physical activity. The relationship between existing adult physical activity guidelines and the proposed older Australians' physical activity recommendations are discussed.

The recommendations

The recommendations reflect the heterogeneity of the older population in terms of physical capacity, activity patterns and cultural diversity. The rationale and purpose underlying each recommendation are explained (see recommendation section of this document).

Recommendation 1

Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.

Recommendation 2

Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.

Recommendation 3

Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.

Recommendation 4

Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up the amount, type and frequency of activity.

Recommendation 5

Older people who have enjoyed a lifetime of vigorous physical activity should continue to participate at this level in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.

A broad range of physical activity options can improve health outcomes for older people, both in the short and medium-term. Endurance and strength training activities can be used to prevent and

treat congestive heart failure, depression, diabetes, osteoporosis and other conditions affecting older people. Progressive resistance training can slow and even reverse age and disease-related loss of muscle mass and function, and activities involving balance can improve stability and reduce risk of falls.

In frail older people, even small gains in physical activity performance might have a significant effect on their functional performance and quality of life. Residential care programs must be feasible, acceptable to staff and residents, and be evaluated using relevant outcomes of function and quality of life. In all settings, those providing physical activity programs for older people should have adequate training and understanding of the specific needs and differences in physical activity for older people.

Very little research in physical activity for older people has investigated issues of effectiveness, implementation, or adherence in important population sub-groups such as Aboriginal and Torres Strait Islanders, and older people from Culturally and Linguistically Diverse Backgrounds. There is a need to ensure the recommendations and implementation strategies are culturally appropriate.

How much physical activity, how often and for how long?

The recommendation of 30 minutes of moderate activity on most, if not all days of the week is relevant for older adults. Activity in any form is beneficial for older people. There is not yet sufficient evidence to allow us to advise on the 'best' intensity or duration of physical activity to adopt to accumulate the recommended amount of daily physical activity. That is, we do not know whether it is preferable to do more intense activity for shorter bouts or less intense activity for longer bouts in order to expend our weekly 'dose' of energy. More research is needed to establish optimal doses of physical activity for older people to achieve comprehensive health benefits, using studies that draw upon a broader range of older people and incorporating close monitoring of compliance rates.

Older people are generally aware of the health benefits of physical activity. However, knowledge alone is often not sufficient to motivate a person to adopt and maintain physical activity behaviour. Interventions incorporating the principles of behaviour change are needed, both to maximise the reach of physical activity promotion initiatives and programs across the older community and to minimise attrition once people begin to be physically active. Programs that include some behavioural techniques and have a community extension or connection are more likely to result in sustained increases in activity. Activity that is assisted by social support and woven into daily activities increases the likelihood of sustained behaviour and associated health benefits. To support older individuals in making behavioural change, modifications to their social and physical environment are needed. Strategies to address negative micro, meso and macro-cultural attitudes toward the concept of physical activity in older people are required. The physical environment will require adaptation to enable safe and enjoyable physical activity options to be readily accessible to all older Australians.

Conclusion

Physical activity provides a range of health benefits for older Australians. Physical activity programs - particularly for the frail old - need to provide not only facilities that are safe, accessible and appropriate, but also a supportive environment to optimise program adherence. The evidence overviewed in this document will assist capacity building for organisations and practitioners to conduct physical activity promotion amongst older people. The focus upon the translation of evidence into practice will engender optimal population health impact.

1 Introduction

The older generation is the fastest growing population group (Clare and Tulpul 1994), making older people's health an increasingly important public health issue. Medical problems occur more frequently with age (Cartwright 1988) and older people are also more prone to adverse effects from medication (Fiatarone Singh 2002). The attendant health care consumption is far in excess of that of other age groups (Clare and Tulpul 1994). It is well established that physically active lifestyles benefit people across the lifespan. Older people can gain health and social benefits from being physically active (Bauman 2004). There are many health benefits associated with increased levels of physical activity: lower incidence of hypertension, heart disease, osteoporosis, degenerative arthritis, colonic cancer and diabetes mellitus, improved mood and memory function, and a better and maintained social network (Pate, Pratt et al. 1995; Mazzeo and Tanaka 2001). In older people, physical activity may also offer a useful alternative to drug management or reduce the need for medication, limiting the problems associated with polypharmacy.

Preventive practice can improve health status and prolong active life expectancy. There is scope for greater targeting of health promotion activities towards older people (Fries, Green et al. 1989; Mahler 1989; Foss, Dickinson et al. 1996). Given the greater absolute risk of ill health in older people, intervening with this population group is vital. It is timely to integrate the growing research and clinical evidence on how 'positive ageing' strategies such as physical activity can be supported and implemented broadly to improve older people's health and well-being. A health promotion approach towards physical activity by health care providers, the individual and the community can usefully be assisted by recommendations specifically tailored for older people.

This discussion document supports a range of associated national policies and strategies, including the National Strategy for an Ageing Australia, the Public Health Action Plan for an Ageing Australia, the Commonwealth, States and Territory Strategy for Healthy Ageing, the Be Active Australia: A Health Sector Framework for Action 2005-2010 and clinical practice guidelines for the management of overweight and obesity. The discussion paper describes and critically analyses existing international and Australian physical activity guidelines/recommendations for older people. The evidence regarding physical activity formats and modalities (e.g. intensity, duration, type) and their relationship to health benefits particularly relevant to older people, such as functional independence and mobility, are reviewed.

The development of the discussion document and the resulting recommendations were guided by the National Institutes of Health (NIH) Consensus Statement's definition of physical activity (given on page 7 above) and by Li and colleagues (2005) heuristic multilevel model of influences on physical activity (Figure 5.1). Chapter 2 outlines the methods used to produce the discussion document and the draft recommendations. Chapter 3 describes the physical activity patterns of older Australians and compares prevalence rates across time and nations. Chapter 4 briefly reviews the consequences of a sedentary lifestyle and summarises the health benefits ascribed to physical activity with regard to the National Health Priority Areas. It then discusses the risks associated with physical activity in older people. Chapter 5 considers the determinants of physical activity behaviour in older people from an individual, societal and structural perspective. Chapter 6 gives an overview of instruments used to measure physical activity in older people. Chapter 7 describes and critiques the existing national and international physical activity guidelines. Chapter 8 discusses the evidence for different types and amounts of physical activity in older people. Chapter 9 reviews the evidence for using physical activity in the primary, secondary and tertiary prevention of health conditions represented by the National Health Priority Areas. The literature relating to frail older people, Indigenous Australians and people from culturally and linguistically diverse backgrounds is discussed. Chapter 10 contains the draft recommendations and outlines their purpose. In brief, the target audience for the recommendations is older Australians. Chapter 11 considers the planning and policy implications of the recommendations. Areas for future research and directions for progressing the development of the recommendations are outlined.

2 Methods

This discussion paper was developed following a review and analysis of the contemporary international and Australian literature, with a primary focus on review of systematic reviews, and randomised controlled trials published since the more recent systematic reviews. A number of concurrent processes assisted the development of the discussion paper and the recommendations. Firstly, we explored the existing evidence base to enable tailoring of recommendations to what is currently known about the capacity of older people to exercise safely. Stakeholders nationally were informed about the project activity and asked for feedback through consultation procedures including a project newsletter, and in latter stages of the project, a project website and consultation meeting and focus groups. The purpose of these consultations was to garner confirmation of the contextual factors that facilitate the adoption and maintenance of physical activity behaviour amongst older people. Stakeholders represented the key appropriate domains, from consumers through to policy makers.

The project team (comprising the project staff and the Expert Advisory Group) participated in two one-day workshops. We used an external Expert Advisory Group to guide the process of recommendation development and refinement. The first workshop was held in the early stages of the project and reviewed the conceptual framework for the project. The second workshop was held mid-way through the project to review the discussion paper and critique the draft recommendations. The principles for guideline development, as outlined by the National Health and Medical Research Council (National Health and Medical Research Council 1998) were used to prepare national recommendations. One of the key principles of guideline development specified by the NHMRC concerns stakeholder involvement, including representatives of all relevant disciplines and consumers. Details of the four stages of the methodological process are described below and outlined in Figure 1.

Phase 1: Framework development

Aim:

The aim of this phase of the project was to reach agreement on the scope of the work and to develop, consolidate and produce a conceptual framework. The framework guided the subsequent phases of the project and the production of the project deliverables.

Process:

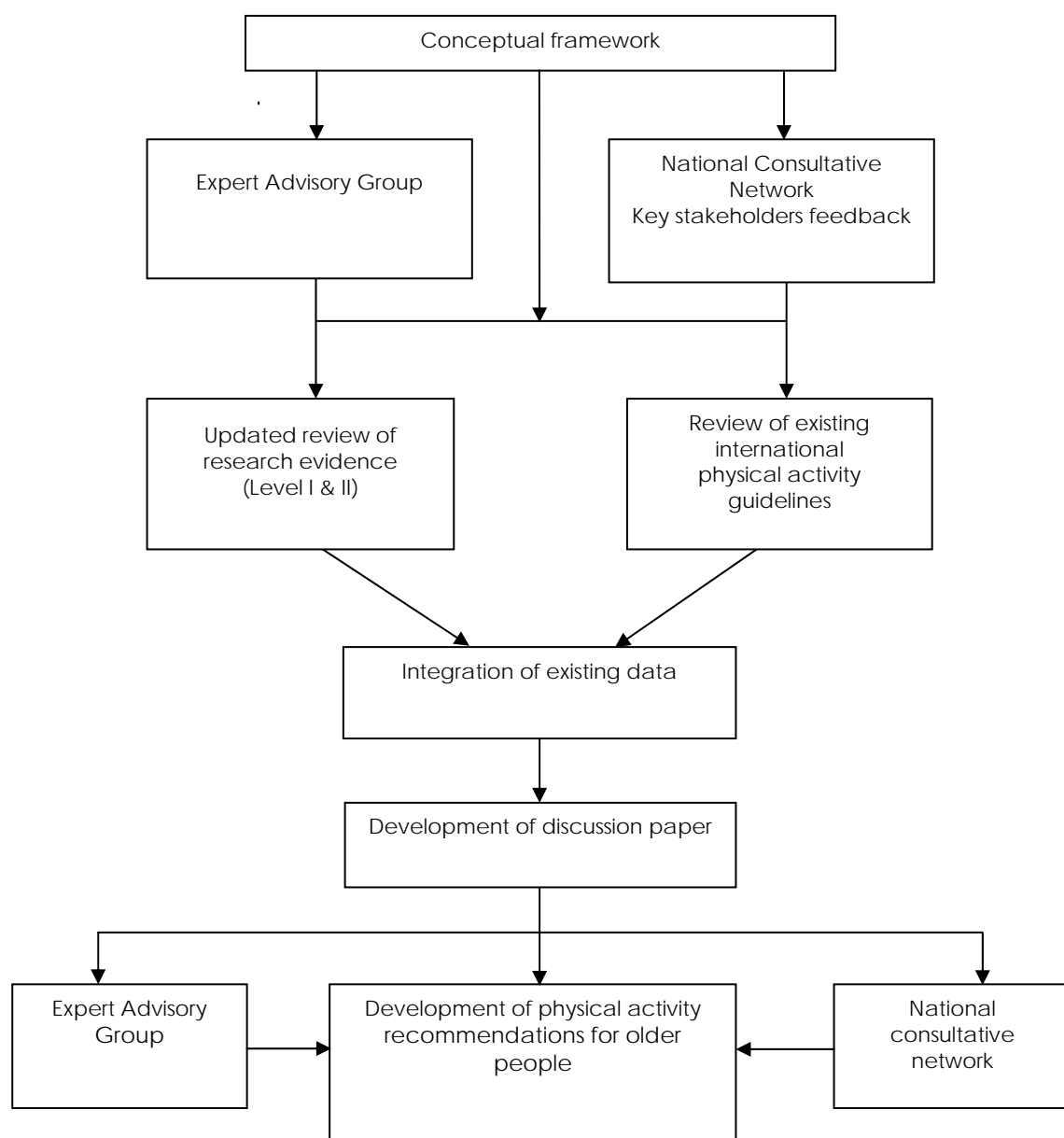
The first project team workshop was held in December 2005. Its objectives were to:

- Agree on a definition of the proposed target group, i.e. 'older Australians', and an accompanying rationale for including or excluding particular age-defined or ability-defined populations;
- Affirm a draft framework for the paper and recommendations;
- Provide feedback on existing Australian and international physical activity guidelines in the context of the developed framework;
- Identify key additional areas that the recommendations would need to ensure are covered;
- Ensure the draft guidelines framework would address key sub-groups including older people from culturally and linguistically diverse backgrounds (CLDB) backgrounds, those who have been sedentary long-term, those with physical and psychological co-morbidities, and issues around the built environment.

Framework development integrated the following elements:

- Using the World Health Organisation (WHO) guidelines (1997), Bauman (2004) provides a useful conceptual model for the benefits of physical activity. The model's domains range from disease prevention and the amelioration of risk through physical, functional and psychological to social health benefits. These domains can be used as a classification system for the health benefits.
- Weighting of risk associated with activity versus inactivity.

Figure 1.1 Project activity flowchart



To ensure that the recommendations are contextually relevant across Australia and that particular sub-groups, such as rural and remote communities are properly accounted for, the project team established a *National Consultative Network*. Key stakeholders were informed about the project, and provided with opportunity to have input to the project through a variety of avenues. The key stakeholders represented a broad cross section of health professionals and organisations (Appendix 1). The following strategies were used:

- An information sheet was forwarded to all peak and state bodies representing aged care, chronic disease, sports and recreation, such as Aged and Community Services Australia, the Royal College of Nursing, the Royal Australian College of General Practitioners, the Australian Divisions of General Practice, NARI volunteers list, Age Concern, National Seniors Foundation, the Council on the Ageing and the Alzheimer's Association.
- Establishment of a web page to provide information about the project and provide a mechanism to receive feedback from interested individuals. This was hyperlinked with relevant sites, including Ageing Research Online and the Australian Association of Gerontology.

The National Consultative Network facilitated rapid and ongoing communication with stakeholders and other interested parties. By promoting awareness of the project, relevant stakeholders were able to consult with others and consider their input and inform the development of this document and draft recommendations.

Phase 2: Reviewing the evidence and existing guidelines

Aim:

The aim of the literature review was to firstly identify the evidence related to the benefits of physical activity in older people. A second aim was to evaluate the level, quality, strength and relevance of this evidence, to identify any gaps in the literature. Additionally, any similar Guidelines that have been produced internationally were obtained and reviewed in the context of the objectives of this project. This information was used to construct recommendations.

Searches:

A review of literature identified the evidence regarding physical activity in older people. All available evidence pertaining to prevalence, strategies and safe models of adoption were reviewed, graded and summarised. In addition to literature specifically about healthy older people, we included literature relevant to the following population sub-groups: Aboriginal and Torres Strait Islander populations, culturally and linguistically diverse (CLDB) populations, rural and remote communities, people with multiple co-morbidities, those with dementia, and those in residential aged care. Documentation related to physical, psychological and social outcomes were included. The scope of the literature review was limited to:

- Systematic reviews published in all key areas related to physical activity outcomes for older people;
- Randomised controlled trials published in areas where there are systematic reviews, that were published after publication of the systematic review;
- Areas deemed relevant where there are no systematic reviews or randomised controlled trials.

The literature was searched electronically for English language systematic reviews and articles published in peer-review journals from 1990 to date. Search strategies were conducted using MEDLINE, CINAHL, PUBMED, EMBASE, AusportMed, APAIS, DRUG, PsychINFO and Current Contents. The Cochrane Library (Central Register of Controlled Trials, and relevant specialised registers including the Musculoskeletal Injuries Group), NHS Centre for Reviews and Dissemination, the Canadian Health Promotion Development Section and similar sites were electronically searched. Searches on the World Wide Web for government and non-government publications, existing guidelines and reports to government occurred. The CDC Physical Activity Website and other relevant sites were accessed (Appendix 2). For Aboriginal and Torres Strait Islander information, the

National Aboriginal Community Controlled Health Organisation and National Aboriginal and Torres Strait Islander Health Clearing House sites were accessed.

Inclusion criteria:

Published studies in English in peer-review journals and systematic reviews from the Cochrane Collaboration were included. Studies from countries with comparable health and older people's support systems to Australia, with similar social or cultural values, were sought.

Exclusion criteria:

Articles published in languages other than English were excluded, plus articles based on personal, expert opinion and literature reviews.

Search terms:

We used search strategies previously successfully used by others and ourselves (Appendix 3). For example, older person related terms used in the Getting Australia Active II report (Bull, Bauman et al. 2004) were complemented by strategies focusing upon RCTs and systematic reviews. We updated the search conducted by Cyarto and colleagues (2004) on the effectiveness of physical activity intervention studies in older adults to incorporate evidence about a range of activity types for older people with varying health status.

Evaluation strategies:

The evidence was rated according to the NHMRC (1998) criteria and scored using established scales produced for assessing the scientific quality of trials and reviews respectively (Oxman and Guyatt 1991; Verhagen, deVet et al. 1998; Hoving, Gross et al. 2001):

1. *Level of evidence.* This rating system refers to the design of reviewed studies.

<i>Level I</i>	<i>A systematic review of all relevant Randomised Controlled Trials (RCT)</i>
<i>Level II</i>	<i>At least one properly designed RCT</i>
<i>Level III-1</i>	<i>Well-designed pseudo-RCTs</i>
<i>Level III-2</i>	<i>Comparative studies with concurrent controls and allocation not randomised, case-control studies or interrupted time series with a control group</i>
<i>Level III-3</i>	<i>Comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group</i>
<i>Level IV</i>	<i>Case series, either post-test or pre-test and post-test.</i>

2. *Quality of evidence.* This rating refers to the quality of the methods used in a study to minimise bias. This factor is calculated by items in the scoring indices (Verhagen, deVet et al. 1998; Hoving, Gross et al. 2001)
3. *Strength of evidence.* This classification refers mainly to the magnitude of the intervention effect. This is based on effect sizes or upon the level of evidence.
4. *Relevance of evidence.* The relevance of outcome measures and the applicability of the study results to the clinical question are considered by this criterion. This factor is calculated by items in the scoring indices (Verhagen, deVet et al. 1998; Hoving, Gross et al. 2001).

All identified and relevant RCTs were independently reviewed and rated by two members of the project team.

In limited circumstances (primarily where in areas where there was a lack of systematic review / randomised controlled trial evidence, or where the issue of relevance was not amenable to quantitative evaluation), qualitative studies were reviewed and examined using the criteria for systematic reviews outlined in the Campbell Collaboration guidelines (2001). Decisions on material

for inclusion in the recommendations were made based upon the rating of the evidence. A formal consensus process was used to decide upon the inclusion of Level III or IV evidence. Studies with relevance scores of either 3 or 4 were used in developing this document. Qualitative studies with a quality and strength rating greater than 9 were referred to.

Assessment of existing physical activity guidelines:

Recommendations often differ across guidelines on the same topic. These differences can be due to a range of factors: insufficient evidence, differing interpretations of the evidence, unsystematic guideline development methods, the influence of professional bodies and cultural factors (e.g. differing expectations of risks and benefits, socio-economic factors or characteristics of health care systems). The Appraisal of Guidelines Research and Evaluation (AGREE) Collaboration has sought to address this situation. The AGREE instrument aims to systematically evaluate guidelines (The AGREE Collaboration 2001). Although this instrument has been designed with clinical practice guidelines in mind, relevant components were used as a template for the assessment of the available physical activity guidelines.

Many of the existing regional, national and international guidelines have been published in a format for consumers. Where possible, we liaised with the funders and authors of such guidelines in order to evaluate how the guidelines were produced, to fully understand the context for their development and the extent to which they are based upon the prevailing evidence base.

A summary of the strengths and weaknesses of identified existing international guidelines / recommendations for physical activity for older people was developed by the project team, and circulated to the expert advisory group to inform the development of the Recommendations.

Phase 3: Formulating the Recommendations

Aim:

The aim of this stage of the project was to formulate the Recommendations for physical activity in older Australians, reflecting all available evidence for best practice. The following key principles guided the process: a focus on improved health outcomes for older people; use of the best available evidence; inclusion of statements about the strength of recommendations; and consideration of the perspectives of all relevant stakeholder groups.

Method:

Using the results of the literature review and the review of existing guidelines for physical activity, we formulated the draft Recommendations.

Phase 4: Refinement of the Recommendations

Aim:

The aim of this phase was to refine the draft Recommendations during consultations with our expert advisory group and stakeholders in the field, via the *National Consultative Network*, and through focus groups with older people.

Method:

A Delphi survey process (Crisp, Pelletier et al. 1997) was used to determine the relative importance, feasibility, and applicability of the draft Recommendations and to reach consensus before compiling the final report. In the first round, members of the expert advisory group received the draft Recommendations and a template for providing feedback. This process was followed by the second face-to-face workshop of the project team and the expert advisory group. At this meeting, consensus on the proposed recommendations was reached. Following review by the Australian Government Department of Health and Ageing, the refinement process also involved widespread national consultation through the National Consultative Network. This provided the third round of the Delphi process, using an online template (options were also available for individuals or groups who would prefer communication avenues other than on-line).

Feedback on the draft recommendations was also received through focus groups with older people.

3 Physical activity patterns in older Australians

This Chapter reports on the prevalence rates for physical activity behaviour amongst older Australians, drawing upon the National Health Surveys and other population surveys and referring to patterns amongst the Aboriginal and Torres Strait Islander community and those from culturally and linguistically diverse backgrounds (CLDB). Comparative data from a number of other countries is also provided.

The proportion of Australians aged 65 years and older is set to increase from 13% (2001 figures) to around 18% by 2020 and by 2051, it could be as high as 29% (Australian Bureau of Statistics 2003). The absolute rates of sedentary behaviour increase with age. According to national data (Armstrong, Bauman et al. 2000), less than half of Australians aged 65 years and over do sufficient physical activity to produce health benefit (via the accumulation of 150 minutes or more of moderate and/or vigorous activity/week). Physical activity prevalence rates are lower in women than men. About a third of the 'insufficiently active' are completely sedentary (Bauman 2004). Adequate physical activity rates amongst those where English is a second language and older people with chronic conditions are lower than in the general population (Taylor, Baranowski et al. 1998). Given the absolute risk of ill health associated with inactivity in older people, there is much to gain at both an individual and societal level from older people being physically active.

Bauman et al. (2003) compared national physical activity levels in adults in 1997 and 1999 and reported a 6% decline in rates of those sufficiently active (63% to 57%). The authors suggested that this might reflect the decrease in available leisure time, with more Australians working, and working longer hours, during this period. The decline was greater than that reported for other countries e.g. United Kingdom (UK), New Zealand, United States of America (US), and the Netherlands (Hillsdon, Cavill et al. 2001; Bull, Bauman et al. 2004). The decline was smaller in New South Wales (NSW) and the Australian Capital Territory (ACT) where a specific media campaign and inter-agency collaboration had occurred. Recognition of the campaign message and knowledge about physical activity was also greater in NSW and ACT. The national decline was not observed amongst older adults. This is encouraging particularly given an older people targeted media campaign in NSW. However interpretation is limited by the sample's age cut-off of 75 years. The most recent data from the 2004-2005 National Health Survey confirms the prevailing trends reported in the literature: moderate and vigorous activity was most common in younger adults. Walking for exercise was most common (around 54%) in the younger old age groups, i.e. 55-64 and 65-74 years, but lowest in those aged 75 years and over (35.7%) (Australian Bureau of Statistics 2006). Compared to the 2001 figures, the proportion of those 65 years and above who are sedentary has increased. Table 3.1 shows the prevalence of sedentary behaviour in older Australians. For both men and women an increasing proportion of those 75 years and over are sedentary. Amongst women aged 75 years and over, the proportion categorised as engaged in moderate levels of physical activity has decreased from 17% in 1995 to 11.6% in 2004-2005 (figures not shown).

Table 3.1 The prevalence of sedentary behaviour in older Australians 1995 to 2005

	Men (%)		Women (%)	
	65-74 years	75 and over	65-74 years	75 and over
2004-2005	31.9	51.5	40.5	58.6
2001	30.9	44.0	38.8	55.9
1995	35.6	44.9	43.7	54.0

Source: ABS National Health Survey Summary of Results 2004-2005 (Australian Bureau of Statistics 2006)

In 2001, Brownie surveyed over a thousand older Australians to determine their physical activity patterns (Brownie 2005). A questionnaire was mailed to a proportionately random sample, stratified by State and Territory from the 2000 Electoral Commission Roll. Responses were obtained from 1,263 people (641 males, 622 females, a response rate of 62%). The study has limitations: the author did not record intensity levels and excluded housework and gardening from the categorisation of

activity frequency/duration. However, just over half reported doing at least 30 minutes exercise most days. Men were more likely to do so than women: they also reported a wider variety of activities. Individual characteristics (e.g., health status and motivation), influenced behaviour in the predicted direction. Sociocultural determinants of health were also predictive of physical activity level, but no regression analyses were conducted. Gym training, Tai chi and yoga were the least frequently reported activity types, with walking being the commonest form of activity reported. The findings were grouped into no activity; low (at least 30 minutes 1-2 times per week); medium (at least 30 minutes 3-4 times per week) and high (at least 30 minutes 5+ times per week). Twenty six percent fell into the 'no activity' category and just over half into the 'high activity category', with 10 and 11% in the low and medium categories respectively.

The latest Exercise, Recreation and Sport (ERASS) survey, conducted by the Australian Sports Commission, indicates that the majority of respondents aged 65 years and over were involved in organised and/or non-organised physical activity (71.6%), with similar figures in both men and women (72.5% and 70.8% respectively) (Standing Committee on Recreation and Sport - Australia 2005). Non-organised activity was the most common type of physical activity, but people did not necessarily participate in one type to the exclusion of the other. The absolute participation rates (any form of physical activity) decreased with age across the sample (from 91.7% in 15 to 24 year olds), but the proportions for organised versus non-organised physical activity were similar across all age groups. Walking was the commonest form of activity that older people participated in (47.6%), followed by aerobics/fitness programs (12.1%) and golf (8.6%). Older people participated in fewer types of activity (1.6 different types on average). Participation in organised physical activity was lowest amongst older people (30.7%, compared to 66.1% in the 15-24 year age group). The mean number of weekly sessions of activity was 4.6 (4.5 and 4.8 for men and women respectively), with a median of 3.9.

The findings from the Brownie and ERASS surveys contrast with those produced from the population based National Health Surveys. The figures are higher than in the multipurpose national surveys because they relate to the physical activity patterns of those responding to a specific physical activity survey, who are unlikely to be representative of the overall older population. All these data sources are limited by the fact that they are based upon self reports in cross sectional surveys. Discussion of methodological issues such as this are beyond the scope of the current document. An overview of measurement considerations is provided in Appendix 4.

Physical activity prevalence amongst Aboriginal and Torres Strait Islanders

The Aboriginal and Torres Strait Islander peoples' prevalence of physical activity is low. Data from 2001 reported physical inactivity amongst 42% of Aboriginal and Torres Strait Islander women and 38% of Aboriginal and Torres Strait Islander men (AIHW 2001). The 2001 National Health Survey noted that, similar to non-Indigenous Australians 70% of the sample reported no or low levels of exercise in the fortnight prior to interview (ABS, 2002). The 2004-05 National Aboriginal and Torres Strait Islander Health Survey collected information about the frequency, intensity and duration of exercise undertaken by Indigenous Australians living in non-remote areas (Australian Bureau of Statistics 2006). The proportion of Indigenous people in non-remote areas who were sedentary or engaged in low level exercise in the two weeks prior to interview was higher than in 2001 (75% vs. 68% respectively). About 60% of adult Aboriginal and Torres Strait Islander respondents to the Queensland Well Person's Health Check Survey (1998-2000) had inadequate levels of physical activity in the preceding week (Miller, McDermott et al. 2002).

People from culturally and linguistically diverse backgrounds

In 1996, 17.8% of the older population were from CLDB, with a further 13.1% of the older population being overseas-born people from the main English-speaking countries (Gibson, Braun et al. 2001). The proportion of CLDB older people is projected to increase, reaching 22.8% by 2016. Amongst those aged 80 years and over, the proportion of people from CLDB was 13.2% in 1996 and is set to rise to 25.2% in 2026. Thus, one in four people aged 80 or over will be from CLDB in 20 years time. The

older, overseas born CLDB population will increase more rapidly over this period than the Australian born older group.

People from culturally and linguistically diverse backgrounds (CLDB) are at greater risk for the health consequences of physical inactivity, given their higher rates of sedentary behaviour (Wilcox, Castro et al. 2000). There are cultural and ethnic differences in physical activity patterns. Unfortunately, much of the evidence emanates from the US and thus has limited relevance with regard to the different CLDB communities in Australia. Some of the more generic findings are salient and will be discussed in Chapter 5 when considering the determinants of physical activity behaviour in older people.

A study by Haralambous and colleagues (2003) examined rates of participation in physical activity amongst older people from four cultural backgrounds: Chinese, Croatian, Italian and Australian born. The groups held unique beliefs about physical activity participation. The Chinese respondents reported high levels of physical activity participation and a low incidence of functional limitations.

Global comparisons

How do Australian trends compare with those of older populations internationally? This section gives a brief overview of recent statistics from overseas.

The 1998 Health Survey for England used a representative national sample and asked about frequency, duration and intensity of activities in the 4 weeks pre interview (UK Department of Health 2001). (The 2000 survey sampled only older people living in residential care). Respondents aged 65 years and over numbered 3270. As reported in other countries, walking was the most popular type of exercise, although 3.9% of over 65 year olds reported being unable to walk. Amongst those 85 years and over, this proportion increased to 13%. Whilst 88% of 65-69 year olds walked for at least 5 minutes in the previous 4 weeks, this prevalence decreased to 51.5% in the 85 years plus group. A significant age decline was also seen for walking at least 15 minutes: from 80.4% to 57.3%. This means that the proportion of older English residents who met the physical activity recommendations (at that time 150 minutes of moderate physical activity per week, based on the US Surgeon General's report) was low and declined with age. Two-thirds participated in less than one 30-minute bout of physical activity per week and were categorised as inactive (UK Department of Health 2001).

The Zutphen Elderly Study in the Netherlands reported a stable five-year prevalence of sedentary behaviour of about 28% amongst their cohort (Bijnen, Caspersen et al. 1998). Total physical activity decreased for the majority of participants (75%) across their ten-year follow-up period. There was a 33% decrease in mean total physical activity, equivalent to 28 minutes per day.

Time-series cohorts with the North Karelia and Kuopio adult populations in East Finland highlight trends in physical activity behaviour over a 25 year period (Barengo, Nissinen et al. 2002). Prevalence of inactivity decreased, but low levels remained relatively stable at around 8%. Prevalence of high (intensity) leisure time physical activity has slightly increased for both men and women. In seeking to account for this, the authors note that working hours have not decreased. Occupational and commuting physical activity has decreased: this may have led to the increase in leisure time physical activity. The increase may also be due to greater health awareness and/or a cohort effect, with more recent cohorts having had greater exposure to physical activity opportunities. The study benefits from use of the same assessment tools at all time points, but the activity categories (leisure time, occupation and commuting) use different domains of physical activity volume.

In 2002/3 the International Physical Activity Questionnaire (IPAQ) was administered by telephone with several thousand Australian and New Zealand adults aged 18 to 65 years (McLean, Smith et al. 2005). Response rates of 55% and 42% respectively were achieved. Both populations appeared active, with 63.7% of New Zealanders categorised as sufficiently active, compared to 58.8%

Australians. It was only for the 50-65 year old group that the New Zealanders were significantly more active than their Australian counterparts (63.2% vs. 50.3%). There were also gender differences, with women being less active in both countries. The majority (74.4%) of New Zealand men were sufficiently active compared to 65.1% of Australian men. There are societal and structural explanations for the trans-Tasman differences. New Zealanders reported fewer physical environment barriers. The long-term government initiatives (eg Push Play and Green Prescription) have targeted men and the older population. This is therefore level IV evidence that the New Zealand strategies are having some impact on physical activity behaviour.

In Canada, around 50% of those 65 years and over are sedentary, with the prevalence rising to almost two thirds amongst those over 75 years (National Advisory Council on Ageing 2003). Statistics from the US suggest that older people remain the least active sector, with a greater proportion inactive than in Australia (US Department of Health and Human Services 2002). At the time of the landmark Surgeon General's physical activity recommendations, 80% of over 65 year old US citizens were not sufficiently physically active (Pate, Pratt et al. 1995) and the figures have not changed markedly in the subsequent decade (Agency for Healthcare Research and Quality and the Centers for Disease Control 2002). In 2000, only 31% of Americans aged 65 to 74 years old and 23% of those 75 years and over reported participating in 20 minutes of moderate physical activity on three or more days per week (US Department of Health and Human Services 2000). Even fewer reported 30 minutes of moderate activity five or more days per week (16% and 12% of the respective aged groups). Recent US figures report an estimated 25% prevalence of inactivity across US adults (Centres for Disease Control 2004). Amongst older Americans, those aged 65-74 spent only 5.2% of their daily energy in leisure time physical activity and 35% on household related activity, with the figures being even lower in the 75+ group (Dong, Block et al. 2004). The United States Behavioural Risk Factor Surveillance System (BRFSS) data for 2004 shows that when asked 'during the past month have you participated in any physical activity?' 22.9% of respondents answered 'no'. However, BRFSS data show that walking for leisure rates in those aged 65 and above increased (by 3.5%) from 1987 to 2000. Increases across a range of activities is needed. Dishman (1994) reported at around this time that 50% of these older people had no intention to begin regular exercise and the statistics would certainly seem to bear this out. Clearly, strategies to modify behaviour in this sector of the population have been limited in impact and there is much scope for improvement.

Table 3.2 Physical activity patterns in three Western countries

	65-74 year olds	75+ year olds	Prevalence measure reported
US	51%	65%	no leisure time physical activity ^a
	25%	46%	physical inactivity ^b
UK	15%	8%	15 min brisk walking past 4 weeks ^c
Canada	50%	63%	sedentary ^d

Source: a) Healthy People 2010 (US Department of Health and Human Services 2000) b) Third NHANES data (Christmas and Andersen 2000) c) UK Department of Health 2002 d) Interim report card: Seniors in Canada 2003 (National Advisory Council on Ageing 2003)

SUMMARY

The proportion of older Australians being sufficiently active, that is accumulating 150 or more minutes per week of physical activity, remains low and has remained relatively stable in more recent surveys. There appears to be an increase in the proportion of those who are insufficiently active who are classified as sedentary. Although difficult to draw direct comparisons between international studies due to different definitions and methodologies, there is an indication that the proportion of older Australians classified as sedentary is slightly lower than countries such as Canada and the United States of America. Consistent with international studies, walking is the most frequent type of physical activity across the older age groups. There is a clear need for more detailed Australian physical activity data from representative samples.

4 The health consequences of physical inactivity and the benefits of physical activity

In this Chapter a summary of the evidence surrounding the benefits of physical activity is presented, together with data on the prevalence of health problems related to physical inactivity, highlighting the morbidity and mortality statistics for older Australians. The impact of physical activity on general quality of life and for each National Health Priority Area is considered. The Chapter concludes with a discussion of the risks associated with physical activity participation in older people.

Physical inactivity is recognised as an independent risk factor for a number of health conditions. For example, the Victorian Burden of Disease Study used relative risk attributable to inactivity plus recent Victorian statistics on physical activity, to produce figures for the disease burden attributable to inactivity for bowel cancer, stroke, ischaemic heart disease (IHD) and type 2 diabetes (Department of Human Services 2001). Physical inactivity accounted for 4% of the total disability adjusted life years (DALYs) figure. The greatest contribution was related to IHD. In Australia, at least \$400 million in direct health care costs can be attributed to physical inactivity, and physical inactivity is associated with around 8,000 deaths per year (Bauman, Bellew et al. 2002). Whilst Chapter 3 highlighted that inactivity is particularly prevalent amongst older people, they stand to achieve at least short-term gains in health from behaviour change related to increasing physical activity. The statistics in the following sections emphasise the importance of physical activity promotion to reduce the prevalence of major health conditions in older Australians and to enable healthy, productive ageing.

4.1 Physical activity and reduced mortality and morbidity risk

Physical activity has therapeutic benefits from primary through to tertiary prevention. There is epidemiological evidence from prospective studies that regular physical activity is associated with a reduction in mortality risk. Data from trials and cross sectional studies confirm the range of health benefits that can accrue from physical activity. There are several reviews of this evidence (Bauman 2004; Taylor, Cable et al. 2004). A number of cohort studies have demonstrated that physical activity behaviour decreases the risk of all cause mortality, cardiovascular and respiratory mortality for both older men and women (Kushi, Fee et al. 1997; Bijnen, Caspersen et al. 1998). In postmenopausal women who exercised only once a week, the mortality risk was reduced (RR 0.78, 95% CI 0.64-0.96). Mortality risk from CVD and all causes decreased with increasing activity: for older men who were most physically active, the relative risks were 0.70 (95% CI 0.48-1.01) and 0.77 (95% CI 0.59-1.00) respectively. Amongst older South Australians, the mortality risk was 74% greater in sedentary older people compared to those who were active to some degree (Finucane, Giles et al. 1997). In the Dubbo study (Simons, Simons et al. 2006), daily walking predicted a 38% lower risk of dementia in men.

Several studies have also demonstrated the reduced risk associated with maintenance or adoption of physical activity, compared to remaining or becoming sedentary in older age. The Zutphen Elderly Study examined trends over five years in elderly Dutch men (Bijnen, Feskens et al. 1999). Their mean age at baseline was 75 years (SD 4.6 years). Adjustments were made for potential confounders such as health status. Although mean total time spent in physical activity declined over the study period, the mortality risk gradient increased from those becoming active (RR 1.36), to those becoming sedentary (RR 1.72) through to those remaining sedentary (RR 2.01).

Table 4.1 Relative risk for overall mortality in older people

	Groups	RR (95% CI)
Zutphen Elderly Study	most active vs. least active	0.44 (0.25, 0.80)
Iowa Women Study	frequently active vs. inactive	0.77 (0.66, 0.90)

Source: Kushi, Fee et al. 1997; Bijnen, Caspersen et al. 1998

4.2 Quality of life

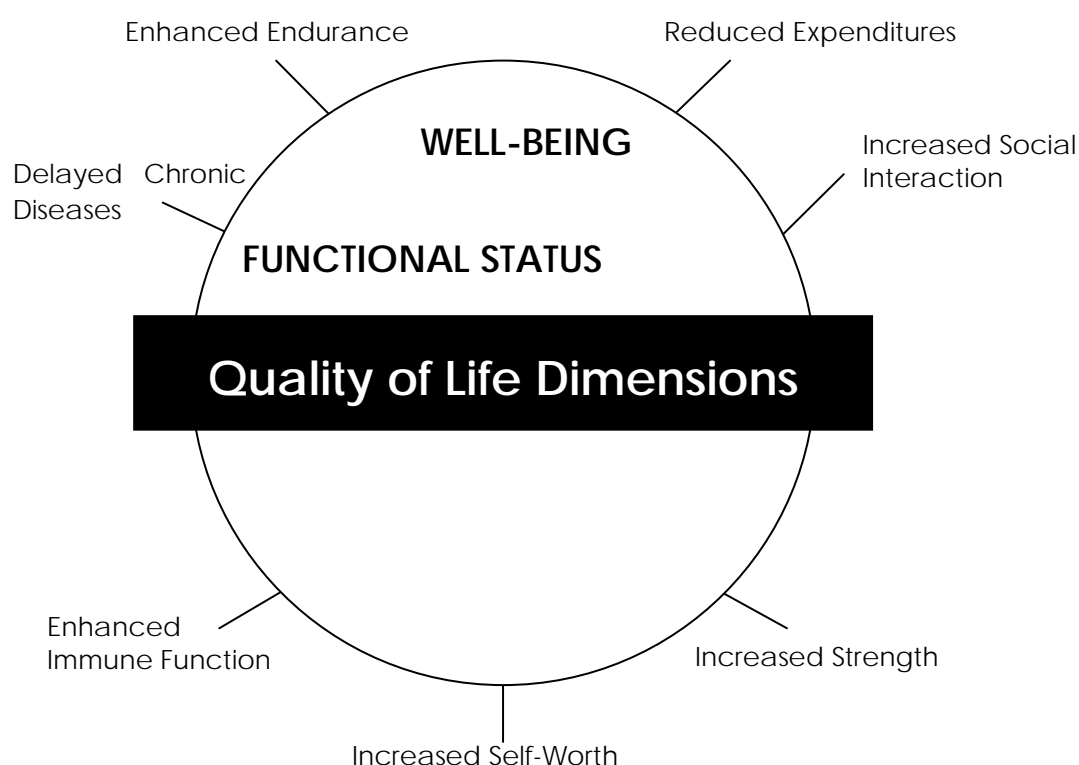
The benefits of physical activity reported in this Chapter can be expected to improve quality of life. There is no evidence that physical activity is associated with poorer quality of life. Physical activity offers an effective, non-pharmacological, public health intervention for increasing and maintaining quality of life among older adults (Burdine, Felix et al. 2000; Rejeski 2001). Those who take regular activity report high levels of life satisfaction (Rejeski 2001). Quality of life is an important construct for both the healthy and the unhealthy older person. The physical activity promotion literature, particularly with regard to older people, has moved from a focus upon achieving 'fitness' towards an emphasis on optimising quality of life.

Attempts to confirm the benefits of physical activity for quality of life status have been hampered by variations in the definition of 'quality of life' across studies and by methodological challenges in the measurement of this concept. In their commentary review of the topic in older people, Ellingson and Conn recommend the use of George and Bearon's definition, since it was specifically developed for older people:

'quality of life is defined in terms of four underlying dimensions, two of which are objective conditions - general health/functional status and socio-economic status - and two of which reflect the personal judgement of the individual - self esteem and life satisfaction.' (George and Bearon 1980).

Gains on the first dimension have been well documented. Improved health can be linked to reduced health expenditure, influencing the second dimension. It can be hypothesised that physical activity can improve self worth and promote social and emotional wellbeing, but the evidence base to support these dimensions of quality of life is sparse. One trial reported improvements in the quality of sleep following moderate intensity physical activity in older adults (King, Oman et al. 1997): there are potential gains for general health and life satisfaction from this outcome.

Figure 4.1 Potential outcomes of exercise that may be related to quality of life dimensions



Source: Ellingson and Conn 2000

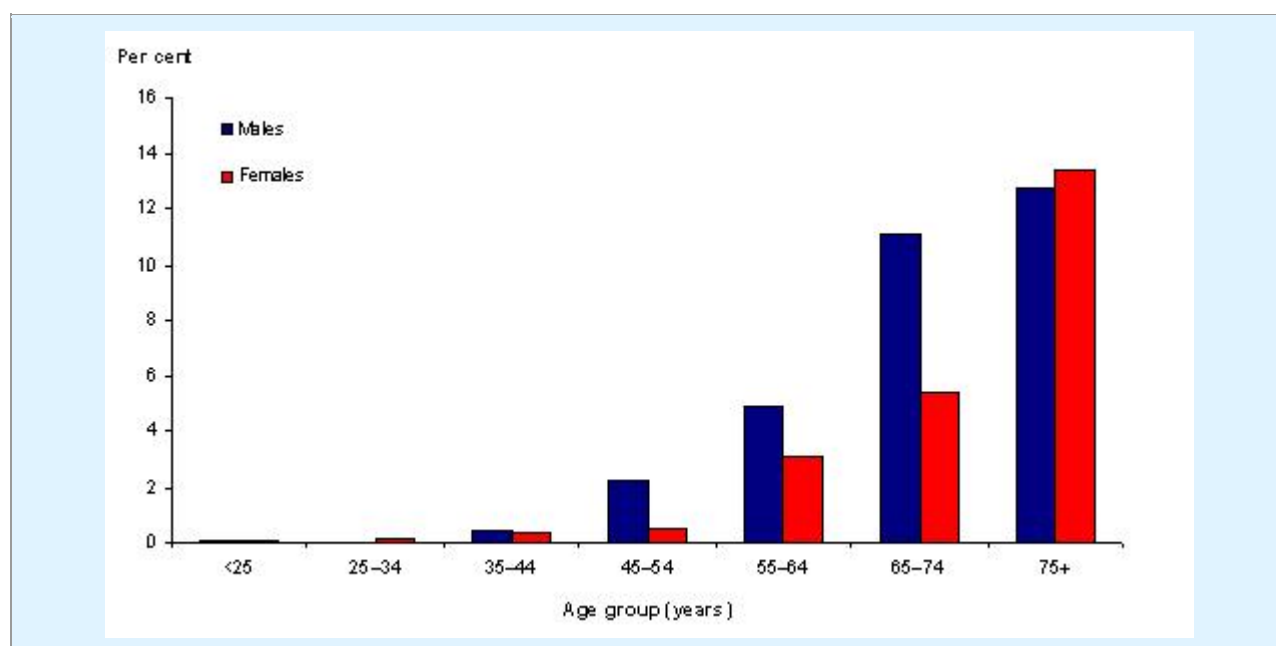
The following sections present the evidence for each national Health Priority Area in turn.

4.3 Cardiovascular disease

Cardiovascular and coronary heart disease are the chief contributors to the disease burden.¹ National figures show that rates increase markedly with age for both males and females (Australian Institute of Health and Welfare 2004). In 2001, almost two-thirds of people with coronary heart disease (CHD) were aged 65 years and over (Figure 4.2). The age-standardised prevalence of CHD is higher among males than females (2.4% of males and 1.6% of females). In 2004–05, 18% of the population reported one or more long term conditions of the circulatory system (heart attack, to angina, stroke, varicose veins and high blood pressure) (Australian Bureau of Statistics 2006). High blood pressure was the commonest (11%) and increased in prevalence from 14% in the 45 to 54 age group to 41% of those aged 75 years and over. Circulatory conditions were chiefly reported by people in middle and older age groups. Almost a quarter (23%) of those aged 45 to 54 years had a long term circulatory condition, increasing to 63% of those aged 75 years and over.

In Europe, heart disease is also the primary cause of ill-health burden, accounting for over 10% of the total (World Health Organisation 2004). In Australia, possibly due to the 'healthy migrant' phenomenon, people from CLDB groups have lower mortality rates for cardiovascular disease than Australian born people, but generally report lower levels of physical activity, increasing their morbidity risk (Australian Institute of Health and Welfare 2004). In contrast, cardiovascular disease is high in Indigenous Australians: the standardised mortality rate is 2.6 times higher than in the non-Indigenous population (Australian Institute of Health and Welfare 2004).

Figure 4.2 Age-specific prevalence of coronary heart disease, Australia, 2001



Source: Heart, stroke and vascular diseases - Australian facts (Australian Institute of Health and Welfare 2004)

Physical activity is inversely related to the incidence of ischaemic heart disease and stroke (at least the ischaemic type), as indicated in the Harvard Alumni cohort study and other populations (Lee and Paffenbarger 1998; Batty 2002; Batty and Lee 2002), including older women (Ellekjaer, Holmen

¹ For ease of reading, the term cardiovascular disease (CVD) will be used throughout this document to relate to cardiovascular conditions, coronary heart disease, stroke, heart failure and peripheral vascular disease. An exception will be made where the information pertains to a specific condition.

et al. 2000). An integrative literature review reported equivocal findings on the relationship between physical activity and two other CVD risk factors, plasma lipid levels and blood pressure (Houde and Melillo 2002).

The risk of coronary heart disease (CHD) is highest in older people, particularly in older women, where the risk increases threefold post menopause (Kannell and Wilson 1995). Whilst there is some observational study evidence that suggests mortality rates are only improved by physical activity for males (Stessman, Maaravi et al. 2000), the Iowa study of postmenopausal women confirmed the risk reduction impact of physical activity on mortality in females (Kushi, Fee et al. 1997). Risk reduction may have been underestimated even in this gender specific study. The researchers, like many others, focused solely on leisure time activity. Non-leisure time activities are often not accounted for, yet older women may derive their total activity from a number of sources, not least incidental activities in the home.

Cardiovascular disease risk is particularly higher in certain culturally and linguistically diverse (CLDB) groups, such as those from the African subcontinent (Briffa, Maiorana et al. 2006). There are few studies that assess the influence of physical activity on health outcomes in CLDB groups. A large prospective study of an ethnically diverse sample of postmenopausal American women highlights the impact of physical activity on cardiovascular risk reduction (Manson, Greenland et al. 2002). There was an inverse association between physical activity and coronary heart disease and overall cardiovascular events. For example, the adjusted relative risk ratios for cardiovascular events across quintiles of brisk walking were 1.0, 0.89, 0.81, 0.78 and 0.72 respectively (Rho for trend <0.001). The findings did not vary significantly according to race, age or body mass index (BMI). In the American Women's Health Initiative study, reduced incidence of coronary events was strongly related to baseline physical activity behaviour in both black and white women (Manson, Greenland et al. 2002). The relative risk of CVD in the highest quintile of energy expenditure (metabolic equivalent MET score) compared to the lowest was 0.55 (95% CI 0.47-0.65) for white women and 0.48 (95% CI 0.25-0.93) for black women.

Cardiovascular disease prevention and management

Physical activity is beneficial in the prevention and treatment of CVD. Although physical activity appears to influence CVD mortality rates in older people, the amount and type of activity to prescribe cannot be unequivocally specified from the available evidence. There is level II evidence that moderate physical activity has cardiovascular protective effects (Bauman 2004) and recent evidence supports the use of walking to reduce the risk of CVD (Lee, Rexrode et al. 2001; Manson, Greenland et al. 2002).

In general, health benefits have been observed for both older men and women. However, there have been concerns that since physical activity recommendations are based on studies largely involving male populations, they may not be generalisable to females. Im (2001) conducted an extensive review of the physical activity literature between 1980 and 1999 and noted that only 13% of the reports included females. Whilst this trend may be changing, it has implications for the generalisability of findings.

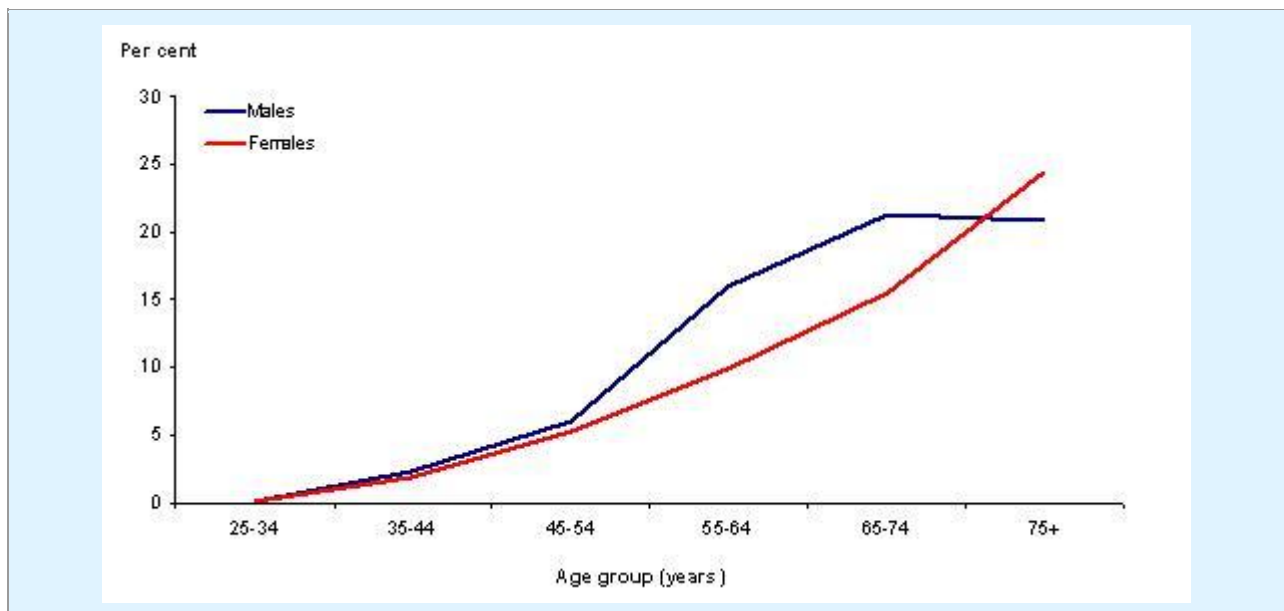
Physical activity has been used extensively in the management of people with CVD. Recommendations for people with CVD have been produced by the National Heart Foundation of Australia (Briffa, Maiorana et al. 2006). The recommendations provide clinical guidance to practitioners when advising older people with pre-existing CVD. Chapter 9 provides details of the secondary and tertiary prevention evidence base as it applies to older people.

4.4 Diabetes

The prevalence of Type 2 diabetes rises with age (Figure 4.3), with prevalence rates being highest among 65-74 year old men and women aged 75 years and over (Australian Institute of Health and Welfare 2002). In 2004-05, almost 700,000 people (3.5% of the population, excluding those with gestational diabetes) had medically diagnosed diabetes mellitus, similar to the 2001 NHS age standardised figures (3.0%) (Australian Bureau of Statistics 2006). A further 56,300 people reported high blood or urine sugar levels, but had not been formally diagnosed. As many cases remain undetected, these prevalence rates are likely underestimate the true prevalence of these conditions. The majority of people with diabetes had Type 2 diabetes (83%), whilst 13% reported Type 1 diabetes and 4% reported diabetes but did not know which type. Among those aged 65 years and over with diabetes, 27% also had one or more circulatory problem.

Prevalence tends to be higher amongst those from CLDB groups, although data collection methods limits accurate information on rates other than across broad population groups (Thow and Waters 2005). The latest edition of 'Australia's Health' (Australian Institute of Health and Welfare 2004) reports higher mortality rates for migrants (apart from those from the UK and Ireland) and more reporting diabetes (35%), with incidence more common in those from the South Pacific Islands, Southern Europe, the Middle East, North Africa and Southern Asia. Type 2 diabetes prevalence is particularly high amongst Indigenous Australians, being their most frequently managed condition in general practice (Australian Institute of Health and Welfare 2004). Indigenous Australians often develop the condition earlier than other Australians and die at younger ages. The age-standardised prevalence of self reported diabetes was 11% amongst Indigenous Australians compared to 3% in the non-indigenous population (Australian Institute of Health and Welfare 2002).

Figure 4.3 Age-specific prevalence rates of Type 2 diabetes among Australians aged 25+, 1999-2000.



Source: Diabetes: Australian facts 2002 (Australian Institute of Health and Welfare 2002)

The association of physical inactivity with diabetes has been illustrated in cohort studies. A prospective study followed 8633 men without diabetes, aged 30 to 79 years, for six years (Wei, Gibbons et al. 1999). Based on cardiorespiratory fitness, the least fit men (those in the lowest 20% percentile) had a greater risk of developing impaired glucose tolerance and diabetes (OR 1.7, 95% CI 1.1-2.7 and 3.7, 95% CI 2.4-5.8 respectively). The risk was greater in older men. The same research centre followed over a thousand men (mean age 50 years) with type 2 diabetes for an average of

12 years (Wei, Gibbons et al. 2000). Physical activity was measured using a maximal exercise test and baseline self reported activity. Adjustments were made for baseline CVD, family history of CVD, fasting plasma glucose, hypercholesterolaemia, hypertension, overweight and smoking. Across age categories, the least fit men were more likely to have died (adjusted RR 2.1, 95% CI 1.5-2.9). Similarly, men categorised as inactive were at significantly increased risk (adjusted RR 1.7, 95% CI 1.2-2.3).

Diabetes prevention and management

Physical activity in conjunction with dietary changes confers benefits in prevention of diabetes amongst high-risk individuals. The US Diabetes Prevention Program was a multi-centre diet and exercise trial of over 3000 adults with impaired glucose tolerance, 20% of whom were 60 years or older (Diabetes Prevention Program Research Group 2002). The intensive lifestyle intervention employed was significantly more effective than the drug metformin (58% versus 31%). The unique impact of physical activity cannot be determined from the study's design. The risk reduction was marked, with a 50-60% risk reduction (Diabetes Prevention Program Research Group 2002).

A meta-analysis of controlled trials demonstrated that regular physical activity increases insulin sensitivity and improves glucose tolerance across a range of CLDB groups (Boule, Haddad et al. 2001). A range of interventions have been trialled to prevent, reduce or delay the long term complications of diabetes. Those applicable to older people with diabetes are discussed in Chapter 9.

4.5 Obesity risk

According to the 2004-05 National Health Survey (NHS) (Australian Bureau of Statistics 2006), the proportion of men and women classified as overweight or obese based on BMI is highest in older age groups (72% of males and 58% of females aged 55-64 years were classified as overweight or obese). Compared to results from previous surveys, the proportion of adults classified as overweight or obese has increased. The proportion of overweight or obese males increased from 52% in 1995 to 62% in 2004-05; for females the increase was 37% to 45% (age standardized and excluding those for whom BMI could not be derived). Increases in both the overweight and obese groups were recorded across both genders and all age groups. The Obesity Trends in Older Australians study reported that older Australians are on average 6-7kg heavier than their counterparts two decades ago (Australian Institute of Health and Welfare 2004). Almost a million older Australians are obese, with rates being higher among Aboriginal and Torres Strait Islanders, particularly males. Compared to 1980 figures, there are now three times more older Australians who are obese, accounting for more than one in five of older Australians. Two thirds of this increase is due to the population increase in obesity rates. The remaining third is due to our ageing population, with implications for future rates. The overweight older people are not necessarily those who have continued to maintain their raised adult weight: many continue to gain weight as they age, at least until they reach the mid-70's. Abdominal obesity is becoming commoner in older age groups. These overweight older people are at particularly increased risk of a range of associated chronic diseases (type 2 diabetes, coronary heart disease, stroke, osteoarthritis, renal disease and some cancers) (Stephenson, Bauman et al. 2000). Obesity can impact adversely on mobility and activities of daily living, influencing both social and mental health.

The US Preventive Services Task Force (1996) summarised level III evidence showing that mortality and morbidity rates are lower in physically active people, even if they remain overweight. This is possibly due to the normalisation of their metabolic profiles. A recent meta-analysis confirmed that physical inactivity creates an elevated risk for all-cause mortality independent of adiposity (0.80, 95% CI 0.78-0.82) and strengthens the evidence for physical activity and adiposity as independent risk factors (Katzmarzyk, Janssen et al. 2003). Since studies tend to adjust for several factors, any difference in relative risk adjusted or not adjusted for one or the other factor does not necessarily reflect the additional unique risk. In the context of the current report, it is also worth noting that the decreased relative risk of all-cause mortality due to physical activity was independent of age.

The statistics for adiposity are not so clear cut. Mortality risk may be attenuated in older people. Seven studies that focused only on those aged ≥ 65 years produced a lower relative risk (0.97, 95% CI 0.91-1.03) than in the overall adult studies (1.24 95% CI 1.21-1.27) (Katzmarzyk, Janssen et al. 2003). More research is needed, but these findings suggest that a focus on physical activity promotion may be more important than one of adiposity for older people.

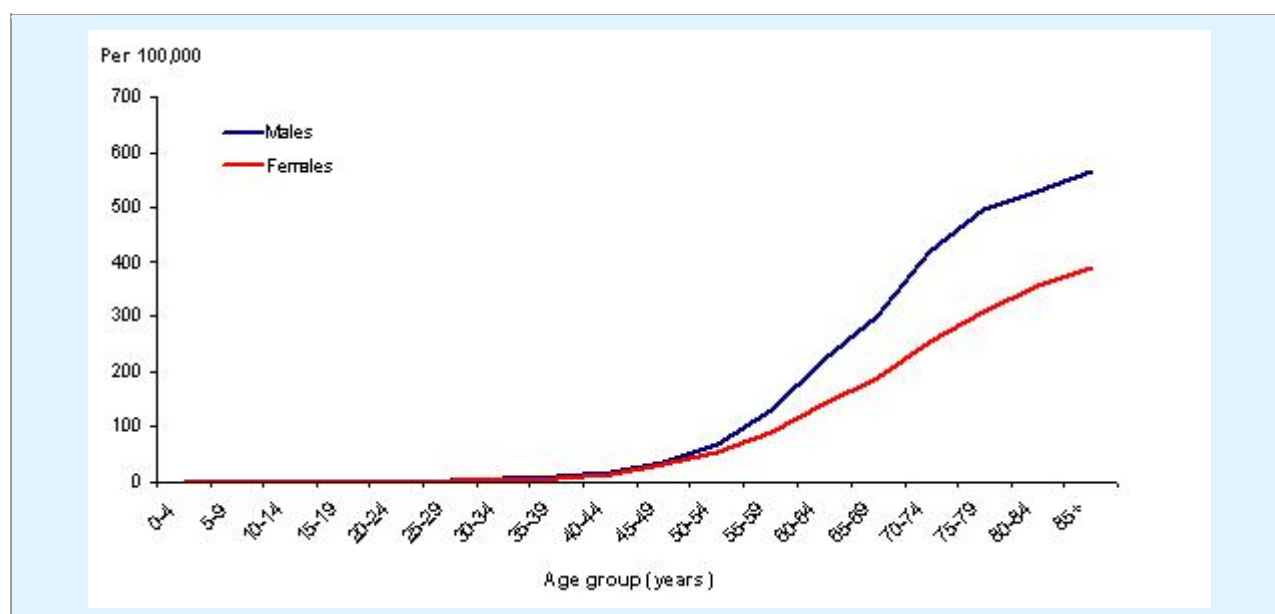
Obesity prevention and management

Physical activity is part of the schedule for the prevention and management of overweight and obesity at all ages. The NHMRC's clinical practice guidelines include physical activity in the behavioural modification treatment options (Department of Health and Ageing 2003). The National Obesity Taskforce is currently considering strategies to reduce obesity in Australia (Department of Health and Ageing 2005). The Taskforce's current focus is upon children and their families, in line with a primary prevention approach. Physical activity promotion will also be important for reducing obesity risk in older Australians.

4.5 Cancer

The current NHS data indicates that 388,500 persons (2% of the population) currently had a medically diagnosed neoplasm in 2004–05 (Australian Bureau of Statistics 2006). Cancer is most prevalent in older people: 6% of 65–74 year old Australians and 8% of those aged 75 and over have cancer (Australian Bureau of Statistics 2006). These figures may underestimate the prevalence, since the current National Health Survey excluded people in hospitals, nursing homes and hospices. The exclusion of these groups is likely to have a greater effect on the survey data for cancer than for most other conditions. The strongest documented links to physical inactivity are for colorectal cancer. The risk of colorectal cancer increases with age (Figure 4.4), especially after the age of 45. The highest incidence is found in people aged 85 and over (Australian Institute of Health and Welfare and Australian Association of Cancer Registries 2003). Colorectal cancer is the second most frequently occurring cancer in Australian men (after prostate cancer) and women (after breast cancer), when skin cancers other than melanoma are excluded. If non-melanocytic skin cancer is excluded, it is the most frequently diagnosed cancer in Australia. In 2000, the incidence rate was 64.8 per 100,000 population. Incidence is much higher in men (80.2 per 100,000, age-standardised) than women (53.8 per 100,000).

Figure 4.4 Age-specific incidence of colorectal cancer, Australia, 2000



Source: Cancer in Australia 2000 (Australian Institute of Health and Welfare and Australian Association of Cancer Registries 2003)

Cancer prevention

Whilst the evidence is strongest for physical activity in the prevention of colonic cancer, the evidence for breast cancer is accumulating. The evidence remains mixed for the prevention of other forms of cancer (Bauman 2004). A cohort study conducted in Australia found that improved prognosis amongst those with colorectal cancer occurred amongst those who were physically active prior to diagnosis (Haydon, MacInnis et al. 2006), confirming previous level III study findings. The sample were not exclusively older people, but their median age was 68 years. The reduced hazard ratio 0.73 (95% CI 0.54-1.00) was significant even once adjusted for age, tumour stage and sex. The authors note that one limitation of their study was that they did not account for activity levels post diagnosis. They also did not adjust for any comorbidities. Further information on the impact of post diagnosis activity on survival and quality of life would be useful.

The association between breast cancer and physical activity is acknowledged. Unfortunately, most of the information comes from studies containing largely Caucasian women. High levels of physical activity have been associated with around 30% reduction in breast carcinoma risk (Gammon, John et al. 1998). A commentary review by McTiernan (2000) indicates that the association and its proposed underlying mechanisms may also pertain to women from other racial backgrounds. The ongoing Women's Health Initiative in the US, which contains diverse population groups in its cohort, should illuminate this relationship further.

4.7 Mental health

In the Australian population, mental health problems affect one in five people during their lifetime. In the most recent National Health Survey, around 10% reported a long-term mental or behavioural problem (Australian Bureau of Statistics 2006). The most commonly reported problems were classified into two groups, anxiety related problems and mood (affective) problems. Prevalence for each was around 4% for males and 6% for females. Self reported rates were lower in the older age groups than in younger adults (118,800 of 65-74 year olds and 112,000 of those aged 75 years and over). Associated medication usage was higher overall in older age groups, but this was related to sleeping medications (11% amongst those aged 65 years and over compared with 5% for the whole adult population) rather than to antidepressant or anxiolytic usage. According to scores on the K10, around two-thirds (63%) of adults were classified as having low levels of psychological distress, 24% with moderate levels, 9% with high levels and 4% with very high levels. These rates are similar to those reported in the 2001 NHS. There are presently no national data regarding the prevalence of mental health problems amongst Aboriginal and Torres Strait Islander people, although the rates of hospitalisation and death due to 'mental and behavioural disorders' e.g. psychoactive substance use and suicide are well known (Australian Institute of Health and Welfare 2004). The commonest forms of mental ill health are anxiety related problems and affective (mood) disorders.

Depression

Estimates of the prevalence of depression among older people living in the community vary widely, from 10% to 35% (Beekman, Copeland et al. 1999; Sayer, Britt et al. 2000; Baldwin, Chiu et al. 2002). Amongst mental health problems, depression ranks as a high prevalence condition and warrants particular attention using preventive measures. Whilst the underlying aetiology and mechanisms are yet to be determined, the relationship between physical activity behaviour and depression is bi-directional. Prospective studies demonstrate that people who exercise are less likely to be- or become- depressed (Brosse, Sheets et al. 2002). Cross-sectional and prospective studies of healthy adult populations have shown an association between physical inactivity and depression (Lampinen, Heikkinen et al. 2000; Kritz-Silverstein, Barrett-Connor et al. 2001) and indicate that a low prevalence of depressive symptomatology is related to exercise behaviour (Blumenthal 1999; Lawlor and Hopker 2001; Baldwin, Chiu et al. 2002) (causality can only be attained via controlled trials). Data from the Australian Longitudinal Study on Women's Health found that depression scores decreased and mental health scores increased with increasing levels of previous, current and

habitual activity (Brown, Ford et al. 2005). Women who were active (one hour or more of moderate intensity activity per week) at baseline were 30 to 40% less likely to have poor mental health and depression scores than those less active. Those in the lowest category at baseline who became more active were also at lower risk of poor mental health scores than those who remained inactive. This association was independent of pre-existing physical or psychological health status. People who have chronic health problems are less likely to be physically active and depression is more common in those with illness than in the healthy (Leon, Ashton et al. 2003).

Mental ill health prevention

There is limited trial evidence for physical activity in the primary prevention of mental health problems. A review of interventions to *prevent* depression in older people did not include any physical activity trials (Cole and Dendukuri 2004). Habitual physical activity has not been shown to prevent the onset of depression. However, there is growing evidence for the use of physical activity in the *management* of depression. This evidence will be discussed further in Chapter 9.

4.8 Injury

In the 2004–05 NHS, respondents were asked about 'events in the previous 4 weeks which resulted in injury for which they had medical treatment or had taken some other action' (Australian Bureau of Statistics 2006). Eighteen per cent of respondents (19% males and 18% females) reported having sustained an injury in the previous 4 weeks. Further information was collected about the most recent injury event in that period. Low falls were the most common type of injury event among older people (4% of those aged 75 years and over) and children (11% of those aged 0–14 years). Within the older population, a third of community dwelling older Australians will experience one or more falls in a 12 month period (Hill, Vrantidis et al. 2004). The costs associated with the 10% of falls causing serious injury have been reported at \$498 million per annum, but the consequences of less injurious falls are often neglected. Factors such as fear of falling and reduced activity level can have a profound impact on older people's function and quality of life and may ultimately increase an individual's risk of subsequent falls.

Falls prevention

Falls prevention programs need to aim to reduce the risk of falls among both the general population and those who have previously had a fall or who are at high risk of falling. Most falls have a multifactorial aetiology. Nevertheless, a low level of physical activity has been identified as an independent risk factor for falls among older people (Gillespie, Gillespie et al. 2003). There is evidence that a range of single or multiple interventions incorporating physical activity can be effective in reducing falls among older people (Gillespie, Gillespie et al. 2003), which is discussed further in Chapter 9.

4.9 Musculo-skeletal health

Joint problems and disorders of the bones, muscles and their attachments to each other are categorised as musculoskeletal conditions. The National Health Priority Area's (NHPA) focus is on osteoarthritis, rheumatoid arthritis and osteoporosis. These conditions contribute significantly to the burden of disease at an individual and societal level. Arthritis and musculoskeletal conditions were the second most frequently managed problem (17 per 100 encounters) by GPs in 2003-04, accounting for almost 12% of all problems managed that year. According to the 2004-05 National Health Survey, over three million adult Australians reported arthritis and musculoskeletal conditions (Australian Bureau of Statistics 2006).

Osteoarthritis is one of the most common forms of arthritis, a term given to the group of degenerative musculoskeletal conditions where there is joint inflammation causing pain, stiffness, disability and deformity. Osteoarthritis is of relevance to older people's health as it commonly develops between the ages of 45 to 90 years. In the 2004-05 National Health Survey, 15% of

respondents (18% of the females and 13% of the males) reported arthritis. Half of these cases (51%) were osteoarthritis, 16% were rheumatoid arthritis and 39% reported they had another type of arthritis or didn't know the type of arthritis they had. The majority (78%) reported that a doctor or nurse had diagnosed their condition. The prevalence of arthritis increased with age from less than 1% of people aged < 25 years to 49% of people aged 65 years and over. The (age standardised) proportion of people reporting arthritis increased from 14% in 2001 to 15% in 2004-05. Part of this increase is likely to be the result of changes in survey methodologies between the two data collection periods.

Rheumatoid arthritis is a chronic inflammatory autoimmune disease involving joint swelling and destruction. Rheumatoid arthritis commonly affects the hand joints producing deformities. Rheumatoid arthritis commonly develops between the ages of 25 and 50: prevalence increases markedly with age. In the 2004-05 National Health Survey, 491,000 people reported having rheumatoid arthritis (Australian Bureau of Statistics 2006).

Osteoporosis is a musculoskeletal disorder where the bone density thins and weakens, resulting in an increased risk of fracture, particularly in the spine, hip and wrist regions. In the 2004-05 National Health Survey, 3% of respondents reported osteoporosis: 1% of males and 5% of females. As with arthritis, the proportion of people with osteoporosis increased with age, from less than 1% of those aged < 25 years to 14% of those aged 65 years and over (Australian Bureau of Statistics 2006). The prevalence was greatest in those aged 75 years and over.

Musculoskeletal health and physical activity

Physical activity has been shown to produce improvements in function and strength and reduce pain in those with musculoskeletal conditions (Roddy, Zhang et al. 2005). Illustrations of the types of physical activity programs used will be discussed in Chapter 9.

4.10 Respiratory disease

The current National Health Survey data confirms that whilst respiratory conditions are common amongst older Australians (30%), other conditions are more prevalent in this age group (Australian Bureau of Statistics 2006). The prevalence of diseases of the respiratory system was 415,000 in the 65-74 year age group and 320,400 in those 75 years and over (Australian Bureau of Statistics 2006). Although older people can be asthmatic, with a prevalence of around 10%, the asthma literature tends to take an early intervention approach and to focus on children, where the prevalence is greatest.

Chronic obstructive pulmonary disease (COPD) (such as emphysema and chronic bronchitis), is an important cause of mortality and is common in older people. It is characterised by chronic airflow obstruction. The symptoms of dyspnoea, peripheral muscle weakness and fatigue create exercise intolerance. This leads to a vicious circle of ill health, with low levels of physical activity contributing to poor mental health and wellbeing and social isolation (Sprit 2004). The prevention literature has been focused upon smoking cessation, but some examples of the use of physical activity in the management of COPD are provided in Chapter 9.

4.11 Risks of physical activity participation in older people

The risks associated with physical activity in older people are not too dissimilar from those for other adults. There are contraindications to physical activity, such as uncontrolled angina or blood pressure. Clinically these need to be addressed whether or not a person intends to be physical active and should only be temporary. The American College of Sports Medicine's 1998 Position Statement on Physical Activity in Older People (Mazzeo, Cavanagh et al. 1998) reviews the evidence for injury in trials and notes that no serious injury nor cardiovascular event has been reported. There have been isolated reports of minor injury e.g. tripping or sprains, but across the wealth of trials, reporting of adverse events has been rare and whilst this may be partly explained

by publication bias, it is likely to reflect reality. For example, in an editorial, McMurdo refers to the exercise program run through the University of Dundee, Scotland. This program sees 1000 older participants per week on a self-referral, no screening, no disclaimer basis. Injuries are scarce. Commonly, modifications have been made to programs to ensure their suitability for people with pre-existing health problems, such as osteoarthritis. Overall, the risks of sedentary behaviour appear to outweigh those associated with physical activity.

Given this evidence, there has perhaps been undue cautiousness surrounding encouraging older people to be physically active. The fears possibly stemmed from the reports of adverse events associated with vigorous activity (as encouraged by previous guidelines). There is evidence from the Framingham Study that strenuous activity may be detrimental to older women's mortality rates (Sherman, D'Agostino et al. 1994). Vigorous physical activity can increase the risk of sudden death, but the individual level risk is outweighed by the benefits (Bauman, Bellew et al. 2002). The current recommendations to begin exercising gradually and with moderate intensity are intended to promote safe physical activity. The evidence reviewed in the current document supports the potential for training even very old people to increase their level of physical activity.

Progression in physical activity intensity is vital. For older people starting or recommencing physical activity, beginning at a low intensity and gradually increasing to a moderate intensity will manage risk. Moderate intensity physical activity has greater potential to produce health benefits. The recent National Heart Foundation guidelines for physical activity discuss indications for specific sub-groups of those with cardiovascular disease requiring medical clearance before commencing physical activity (Briffa, Maiorana et al. 2006). It is encouraging to note that across the published chronic heart failure (CHF) trials, very few adverse events have been reported, no deaths or cardiac arrest and minimal orthopaedic injuries or serious arrhythmic events during training itself and few deaths during the studies (Witham, Struthers et al. 2003). In a systematic review (Smart and Marwick 2004) of 81 studies, representing 2387 people and more than 60,000 person-hours of physical activity there was no significant difference in the likelihood of deaths or adverse events between exercisers and controls with CHF during the trial period and an odds ratio of 0.71 for deaths in exercisers, indicating improved survival. These findings are particularly encouraging since many schemes have been conducted in the home, without telemetric monitoring.

There is consensus that physical activity programs should include a warm-up and a cool down phase. However, a systematic review based on five studies could find no support for the benefit of stretching before or after exercise to protect against muscle soreness, nor significant reduction of injury risk (Herbert and Gabriel 2002). The generalisability of these findings to older people requires testing. For community or residential care based programs, having an emergency procedure plan in place will help to deal with any injuries or adverse events that may arise. Minimisation of risk will also be assisted by the recent introduction of International Curriculum Guidelines to prepare physical activity instructors of older adults. The International Society for Ageing and Physical Activity has produced these in collaboration with the WHO's Ageing and Life Course section (Ecclestone and Jones 2004).

SUMMARY

Physical inactivity in older Australians is an independent contributor to many important health problems. The potential benefits of activity for older people are substantial. Most evidence for benefit to mortality and for cardiovascular events is from epidemiological studies. Actual trials of physical activity promotion have been limited in duration and thus more likely to report impact on intermediate health outcomes.

5 Determinants of physical activity behaviour in older people

This Chapter considers the determinants of physical activity behaviour in older people from an individual, societal and structural perspective. Older people will decide whether or not to be physically active based upon a range of personally held attitudes and beliefs. These in turn can be influenced by the person's social environment and the perceptions of society at large. The adoption and maintenance of physical activity is also influenced by the physical (or built) environment that people live in (Giles-Corti, Broomhall et al. 2005). Each of these areas will be considered in turn. The conceptual framework on the following page (Figure 5.1) illustrates the determinants of physical activity in older people operating at these three levels: individual, societal and structural.

5.1 Individual beliefs, attitudes and behaviour

Older people are generally aware that physical activity produces health benefits, but like other age groups, express barriers to its adoption (Cohen-Mansfield, Marx et al. 2003). Two barriers found particularly amongst older people are concerns about the risks of physical activity for those with existing health problems and age itself: 20% of the older people in the above mentioned study thought that they were too old to exercise (Cohen-Mansfield, Marx et al. 2003). These barriers can be addressed by a healthcare provider / health educator: such counselling will be discussed further in section 5.2.

A person's beliefs in their capability to be physically active (under a range of circumstances) will influence their actions. Similarly, the strength of their beliefs that certain consequences, for example improved health and wellbeing, will be achieved by undertaking physical activity clearly influences both adoption and maintenance of that behaviour. Several theories have been used to understand personal physical activity behaviour and to underpin interventions construction to optimise successful outcomes (Burbank and Riebe 2002; Browning, Menzies et al. 2004). These are principally social learning theories, such as:

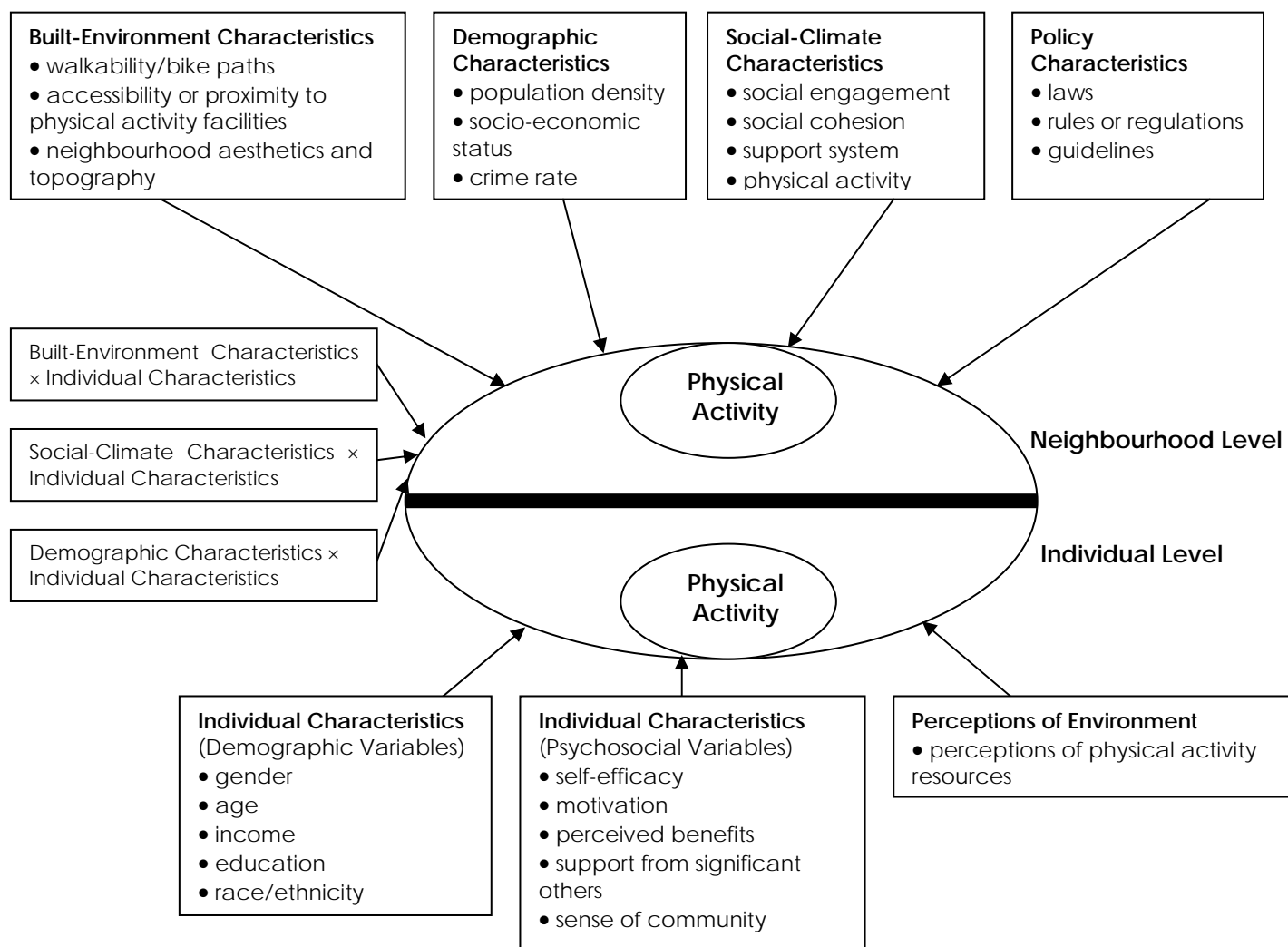
- The Health Belief model,
- The Transtheoretical model,
- Relapse prevention,
- Social cognitive theory, and
- Self efficacy theory.

Briefly, behavioural, cognitive and personal factors interact with environmental influences to determine a person's observed behaviour. Two common objectives when applying these theories to physical activity interventions are to optimise the personal control over the activity and to recognise the importance of the perceived outcomes for the participant. It is beyond the scope of this document to detail these theories. A comprehensive review of the value of self efficacy in physical activity adoption and maintenance is available (McAuley, Pena et al. 2001).

Behaviour change programs tailor programs according to a person's readiness to change and their activity preferences. Health professionals have used motivational interviewing techniques to encourage people to take up physical activity (Adams and White 2003). They encouraged participants to integrate physical activity into daily living. Both planned and unplanned activity has been promoted using a range of social cognitive theory based models. Goals are set and strategies to maintain activity and avoid relapse, such as positive feedback, social support and problem solving are used (Cress, Buchner et al. 2005). The findings have been positive across a diverse range of populations and settings. In their review of physical activity interventions, Kahn et al. (2002) found individually-adapted behaviour change programs to be effective. Four studies in the review focused on people aged 50 years or above where the positive outcomes were time spent being physically active (McAuley, Courneya et al. 1994; Jarvis, Friedman et al. 1997), maximum oxygen consumption (King, Haskell et al. 1991), attendance at sessions or sessions completed (King, Haskell et al. 1991; McAuley, Courneya et al. 1994) and physical function, such as strength and flexibility (Jette, Lachman et al. 1999). Although there is evidence that these

interventions can produce short term impact, the findings about longer term maintenance to date are disappointing

Figure 5.1 A heuristic multilevel model of influences on physical activity.



Source: Li et al, 2005

Adoption: mediators of physical activity uptake

Factors mediating an individual's adoption of physical activity fall along a continuum, with immutable and modifiable as the end points. Chronological age falls into the first category, then health, socio-economic status and disability, with attitudes and behaviour being potentially more modifiable. Physical activity behaviour can be modified and there is a growing literature concerning the effectiveness of interventions that aim to change older people's physical activity behaviour. Earlier interventions may have failed to achieve intended outcomes at least in part as they often failed to directly address the barriers to participation. Other potentially modifiable features are societal and structural factors, such as social and physical environment. These are discussed in Sections 5.2 and 5.3.

The impact of motivating factors has not been fully tested in older people, although interviews with older people indicated that self efficacy was the most important predictor of all domains of physical activity: intensity, frequency, session duration and months per year of physical activity engagement (Conn, Burks et al. 2003). A UK trial with adults attending a general practice used free vouchers to the leisure centre as an incentive, but these did not produce a significant impact on behaviour (Harland, White et al. 1999). There is encouraging level II evidence from the United States that a brief motivational strategy, namely the use of weekly phone and mail prompts, can help to sustain physical activity behaviour in older adults (Conn, Burks et al. 2003). The factorial experimental design showed that three brief motivational interviewing sessions based on social cognitive theory did not of themselves impact significantly on activity. The United States Community Health Advice by Telephone (CHAT) study is a randomised controlled trial comparing *cognitive* mediation (self efficacy, beliefs and outcome expectations) with *social* mediation via social support (King, Friedman et al. 2002). The findings of this trial have not been published as yet.

The maintenance of physical activity behaviour: the challenge of adherence

Maintaining physical activity behaviour is critical. Whilst the underlying reasons may differ, older adults show similar rates of attrition in exercise programs to younger adults. Approximately 50% of people drop out of programs within 6 months of starting them (Dishman 1994). For example, Ettinger et al. (1997) reported 85% adherence in the first three months, 70% at nine months and 50% at 18 months for an aerobic exercise program designed to manage degenerative joint disease. The adherence to an aquatic exercise program for arthritis was only 28% amongst volunteer participants (Belza, Topolski et al. 2002). As Patrick et al. (2001) noted, the program's reach and desired impact was limited and so its cost effectiveness must be questioned. Fortunately, some public health benefit can be obtained even where there is limited adherence, e.g. (Clark, Stump et al. 2003) but researchers and program planners should still strive to optimise adherence in their programs.

Williams and Lord (1995) considered psychological, physiological, and health and lifestyle factors that could explain adherence to a 12 month structured exercise program for older women. In their trial, 78% of participants continued to exercise beyond the trial for at least 6 months. Multiple regression analysis revealed that most of the variance in adherence was explained by reduced muscle strength, slow reaction time, and psychoactive drug use during the trial. Muscle strength, reasoning ability, depression, and self-reported improvement in strength best predicted continued participation.

Clark has noted the need to assess different strategies for optimising the reach of and adherence to exercise programs (Clark 2001). Depression is associated with poor participation in physical activity and health promotion programs (McAuley, Courneya et al. 1994), making it particularly critical to fully engage participants with depression in enjoyable activity to enable sustained benefits. Studies that have evaluated community-based interventions for frail older people have tended to report poor adherence rates (Morey, Cowper et al. 1989; McMurdo and Johnstone 1995) amongst those with poor mobility and multiple chronic conditions, highlighting the need for more tailored interventions to promote ongoing physical activity.

Several authors, including King et al. (1998) have recommended key features to enable program adherence by participants:

- Preceding and ongoing education,
- Pre-screening,
- Motivational techniques,
- Activity choice,
- Flexibility in meeting goals and targets, and
- Individualised schedules.

Although an individual needs to decide to become physically active, a range of external factors can increase their motivation to do so. Being properly informed about the benefits of exercise and how programs can be tailored to one's particular health status can overcome some of the barriers to exercise, such as fear of injury or concerns about unpleasant sensations associated with exercise. Using suitably qualified staff will assist older people in starting and maintaining a physical activity regime. Even where most of the activity occurs in the home and surrounding community rather than at a facility, people will need some support to maintain their activity levels.

Long term adherence can be improved when the person makes physical activity part of their lifestyle (King 1991). Whilst some older people may prefer to exercise at home or on their own, for others joining a group based program can assist adherence via social interaction and the mutual commitment amongst participants (King, Rijeski et al. 1998). Group based physical activity also allows instruction and review of technique by a qualified instructor, overcoming some of the safety concerns mentioned above that act as barriers to physical activity in older people (Cohen-Mansfield, Marx et al. 2003).

Lower intensity physical activity that is incorporated into daily activities is generally more acceptable to older people, and has greater potential for long-term compliance (DiPietro 2001). Once people have begun to experience the benefits of physical activity, then there will be opportunities to work with them to progress the intensity of the physical activity.

5.2 Societal influences

Both generational and secular influences can shape physical activity patterns. The current generation of older Australians are influenced by historical perceptions about the appropriateness of physical activity behaviour in older people. The current generation of older people were exposed to a physically active lifestyle, but where the activity was related to occupational and domestic tasks, rather than to active leisure pursuits or sports engagement. There is a viewpoint that sedentary behaviour is part of growing old. Decreasing sedentary behaviour amongst older people is critical, particularly for the current generation where the adage that 'old age is for resting' still tends to prevail. Many cohort studies have shown the strong inverse association between physical activity behaviour and age, independent of actual health status (Armstrong, Bauman et al. 2000; Semanik 2002). Whilst expectations are changing and being challenged by media campaigns, the older generation and society at large have not wholly embraced the health promotion message that physical activity is useful at any age. This issue is particularly pertinent with regard to older women: society has tended to view physical activity, at least in the form of 'exercise' as more male-oriented behaviour. Ageist stereotypes can impact adversely on older people's behaviour, not least physical activity behaviour. This topic has been discussed in a comprehensive commentary paper (Ory, Kinney Hoffman et al. 2003). The authors highlighted a range of strategies to address ageism and promote healthy living, including: education, particularly training for care providers, media campaigns, intergenerational programs and alterations to the built environment.

The concept of self-presentation is pertinent to physical activity behaviour in older people. Self presentation is the monitoring and control of how one is seen by others. There is evidence that older people are sensitive to health and ageing changes that may make them be perceived as dependent or inept. This may lead them to pursue physical activity in order to be viewed more positively. Alternatively, their self perception may be linked to beliefs that it is inappropriate for older people to be seen exercising, producing the opposite effect (Martin, Sinden et al. 2000).

Nor can we rely upon early active lifestyle patterns being sustained into older age. Older people both commence and cease being physically active for a range of reasons. Indeed, the inter-generational association for physical activity behaviour is relatively weak at around 0.3 (National Centre for Health Statistics 1999).

One possible reason for giving up physical activity may be the person's limited exposure to different physical activity types. For instance, responses from older women (65-97 years old) highlighted that

most respondents had only experienced one type of physical activity (Conn, Minor et al. 2003). It can be hypothesised that over time, the initial enthusiasm for and benefits from one type of physical activity may wane. Encouraging older people to consider a varied 'diet' of physical activity, meeting a range of biopsychosocial needs, may be helpful. Additional factors including socio-economic status and costs associated with physical activity participation (not just costs of the physical activity program itself, but hidden costs such as clothing, runners, and other equipment) can also influence initial and longer term participation.

There is acknowledgement that one's social and physical surroundings can influence behaviour patterns. To influence the social milieu, there have been a wealth of health education campaigns promoting physical activity in Australia. A specific campaign targeted older people during 1999, the International Year of Ageing. In their review of different approaches to increase physical activity, Kahn et al. (2002) provided examples of informational interventions, social support in community settings and an environmental and policy intervention to illustrate the various options for promoting physical activity beyond the individual level. The first two are outlined below and the third is discussed in Section 5.3.

The informational interventions included use of staircase promotion signs, an approach that is applicable to all age groups, although it may not be suitable for older people with mobility impairment. The signage would need to be supported by access to safe, well-lit staircases to have optimal effect.

Community-wide campaigns are effective in increasing physical activity behaviour (Kahn, Ramsey et al. 2002). They entail multifaceted, comprehensive, highly visible strategies. Apart from the NSW media campaign evaluation (Bauman, Armstrong et al. 2003), there has been limited analyses of the specific impact of such campaigns on older people's behaviour. One recent example comes from a longitudinal study of two US communities, who were surveyed at baseline, 3, 6 and 12 months. In this quasi-experimental design study, the 'intervention' community was targeted using paid advertisements, public relations, and community participatory planning. These strategies significantly raised awareness and achieved sustained changes in physical activity amongst sedentary older people (50-65 year olds) (Reger-Nash, Bauman et al. 2005).

Social support - from peers, family and friends – contributes to the uptake of physical activity, but its relative impact has yet to be fully determined. Mentoring and buddy schemes, telephone reminders and incentives have been used, but methodological weaknesses limit the interpretation of the studies' findings (National Centre for Health Statistics 1999). The social support model was used in nine studies reviewed by Kahn et al, mainly with middle aged populations (Kahn, Ramsey et al. 2002). The common aim of these models is to establish and maintain strong social networks to encourage social relationships that will engender behaviour change. Typically, a buddy system operates, with people 'contracted' with one another to achieve physical activity targets through companionship. The 'Walk and Talk' programs in Australia are an example of this model. In the US, a two year study focused on older, postmenopausal women (50-65 years old) in walking groups and found good levels of compliance with the three miles three times per week schedule (Kriska, Bayles et al. 1986). Physical activity was monitored by self report and using Caltrac™ activity monitors. The relative impact of self monitoring, phone prompts and incentives was not reported.

The social capital literature provides level IV evidence of an association between social capital and health status. There is some evidence about physical activity in adults per se, but influences amongst the older adult population require greater assessment. It can be hypothesised that communities where social cohesion and connectedness are greater are more likely to provide an environment that promotes physical activity. Such neighbourhoods are more likely to be viewed as safe to walk in. There is more likely to be support to engage in physical activity, be it from an active neighbour or significant other. There will be places to go for physical activity, both indoors and outdoors. The importance of environmental factors is discussed further in Section 5.3.

Aboriginal and Torres Strait Islanders

There is limited information concerning the knowledge, attitudes and beliefs of individual Aboriginal and Torres Strait Islanders about physical activity, but we can glean some evidence from representative organisations. In their submission to the National Physical Activity for Health Action Plan, the Bidjerdii Aboriginal and Torres Strait Islanders Corporation Community Health Service Central Queensland Region emphasised the importance of an inclusive approach to physical activity promotion (Fredericks 2004) :

' All people need to be able to access a range of activities, from older Aboriginal and Torres Strait Islander people... people with a disability' (pg 10).

They were particularly supportive of flexibility exercises, given the need to address the needs of the mobility impaired older members of their community. They endorsed the use of group and community-based activities for not only the traditional health benefits but also for 'enjoyment, challenge, self-expression and social interaction' (pg 10).

For Aboriginal and Torres Strait Islanders, strategies that incorporate extended families, use role models and highlight connectedness to the land have been suggested (National Aboriginal Community Controlled Health Organisation 2005). As with other groups, older Aboriginal and Torres Strait Islanders are more likely to participate in physical activity when there are pleasant surroundings and opportunities for social interaction (National Physical Activity Program Committee 2001).

People from CLDB populations

There is ample evidence on the barriers and facilitators to physical activity participation in older people, but less about influences amongst CLDB older people (Eyler, Brownson et al. 1999). Differences may be found between migrants with differing immigration histories. Researchers note that cultural differences may also be confounded by socio-economic status, since many migrant communities are socio-economically disadvantaged. People from CLDB and non-CLDB groups have reported common barriers to physical activity adoption: access restrictions due to costly programs and limited transport thereto, and unsafe environs, but the CLDB groups have noted the adverse effect of culturally inappropriate programs (Seefeldt, Malina et al. 2002). There is very limited information about variations in the perception of physical activity behaviour and its relative value across cultures (Eyler, Brownson et al. 1999). In addition, some differences may be found between migrants with differing immigration histories.

Women from Italian, Anglo-Celtic and Vietnamese communities in Melbourne (Bird, Kurowski et al. 2005) participated in a survey and focus groups to discuss their participation in physical activity and their physical environment. The findings highlighted the common importance of access to recreational facilities, the aesthetic features of activity venues, access to neighbourhood cycle and walking trails. Similar to other studies, fear of crime was identified as a barrier and positive aesthetics as an enabler of physical activity across all the CLDB groups. A broader study, with people from the Macedonian, Greek, Indian, Maltese and Serbian communities has commenced, including geographic mapping techniques.

Further research to address these gaps in the evidence base should be a priority.

5.3 Structural influences

In this section, means of delivering the physical activity health promotion message and the options for providing physical activity programs for older people are considered. The influences of social planning and the built environment are then discussed.

Delivery media: from written materials to use of the Internet

Many strategies have been used to disseminate the physical activity health promotion message. The evidence base indicates that individually tailored advice is likely to be preferable to the use of generic materials. Increasingly, the advice is tailored according to the tenets of an underlying theoretical model, such as those referred to in Section 5.1. King and colleagues' review of the options concluded that greater success was attained where interventions used behavioural and/or cognitive strategies rather than health education or instruction alone (King, Rijeski et al. 1998).

In recent times, advice has been provided via telephone and Internet. Reger and colleagues (2002) used media advertisements, public relations campaigns and workplace programs to promote daily walking amongst older Americans. They also sought to build community capacity via the involvement of the community in a local advisory committee that advised the project. The authors reported a 20% increase in walking and a significant increase in the proportion of participants doing 30 minutes of activity per day in the intervention area, compared to the control area. Marshall et al. (2005) explored using the Internet and email as a means of disseminating physical activity information. Their sample of Internet users reflected previous findings that GP advice and group activity were the most popular sources of support. However a third listed Internet and email as desirable sources: 8% of these respondents were 65 years or over. With increasing access to the Web, electronic resources may be an additional option for some.

Options for providing physical activity programs for older people

There is no clear evidence for any preferred delivery mode (King, Rijeski et al. 1998). Hillsdon et al's Cochrane review suggests that more consistent effect estimates emerge from interventions that include professional guidance and self-direction, along with continued professional support (Hillsdon, Foster et al. 2005). Cyarto and colleagues' review suggested that the best outcomes for older people were obtained by interventions featuring greater levels of contact plus multiple reinforcement of the physical activity advice and messages (Cyarto, Moorhead et al. 2004). The US-based Activity Counselling Trial (ACT) reported that whilst women showed improved outcomes with more intensive support, this was not so for men (Simons-Morton, Blair et al. 2001). It is likely that a range of options, tailored to the individual, will be needed to assist the maintenance of physical activity behaviour. For example, the US CHAMPS study produced programs that accommodated for older peoples' health, activity preferences and local environment (Stewart, Mills et al. 2001). In addition to minimising injury risk, the programs sought to optimise motivation by reducing barriers to activity. The researchers used face-to face behavioural counselling and cognitive techniques to encourage older people to use local exercise venues or to develop their own physical activity programs. Participants attended information meetings, planning sessions and monthly workshops. Participants were strongly encouraged to attend at least the initial two workshops, where a walking clinic was offered. To maintain their involvement they received activity diaries, telephone calls, newsletters and physical function assessments. A range of similar models is currently being field tested in the USA as part of the National Blueprint program.

Settings for physical activity programs: home and facility based

A range of settings have been used for physical activity promotion. For ease of categorisation, these can be described as home based versus facility based. The content may be either structured or unstructured in format (Dunn, Marcus et al. 1999). Home based activity encompasses not only physical activity in the home, but also independent walking. Facility based programs include group programs in the community and specialist in-patient and outpatient rehabilitation programs. Both home and externally based programs have been shown to be effective in achieving health benefits (Hillsdon, Foster et al. 2005). A recent review found that home-based, group-based and educational interventions can all increase physical activity, but the changes were modest and short-lived (van der Bij, Laurent et al. 2002). Home based programs have been beneficial not only for healthy older people, but also those with chronic conditions such as chronic obstructive

pulmonary disease (COPD) and arthritis and those undergoing rehabilitation following a myocardial infarction or coronary artery bypass graft (Atienza 2001). In a Cochrane systematic review, home based programs for older people were considered preferable to facility based programs for promoting adherence, particularly in the longer-term (Ashworth, Chad et al. 2005). One trial reported greater adherence to a home based than to a group based program (75-79% versus 53% respectively) (King, Haskell et al. 1991). In another physical activity study involving older people, King and colleagues noted that there was greater adherence to the home based than to the class based formats (King 2000). Whilst group programs may afford social interaction benefits as well as physiological gains, not all older people will need or desire this aspect of physical activity. There may be practical reasons why some older people prefer home-based programs (Dishman 1994; Tai and Iliffe 2000; Atienza 2001). Home based programs have the potential to provide cheaper physical activity programs, but for older people with comorbidities they will often need to be preceded by training by a health practitioner or exercise facilitator, to ensure that the program is conducted safely and correctly.

Counselling in primary care

Individuals have commonly been assisted to exercise using written materials and advice from health professionals. General practitioners (GPs) in particular are seen as trusted sources of information about health behaviours. Since older people regularly visit a GP, physical activity promotion in the general practice setting has the potential to reach a large proportion of this population group. Many GPs also provide medical care to people in residential aged care accommodation. The majority of general practice based interventions have focused on advice, in some instances supported by telephone follow-up or referral to a facilitator or program (Goldstein, Pinto et al. 1999; Elley, Kerse et al. 2003).

A review of strategies for use in the primary care setting to promote physical activity (Eakin 2001) identified 15 studies. Interventions targeting people aged 50 and over were less effective in the short-term when compared to those targeting younger adults. The authors concluded that for short term gains, physical activity-only interventions were more effective than multiple risk factor interventions, but better results were obtained for multifaceted interventions in the longer term. Written material appeared helpful. Short term benefits were reported independent of the type of person delivering the intervention. Brief counselling (3-10 minutes) was as effective as longer counselling (>15 minutes). They found no unequivocal additional benefit to using theory based interventions or incorporating participant follow-up, although tailoring advice according to readiness to change behaviour was effective in shorter interventions. Since this review, other trials have been conducted in the primary care setting. An educational intervention for Victorian GPs improved physical activity behaviour and health outcomes in their older patients compared to a control group (Kerse, Flicker et al. 1999). In addition to brief advice giving by GPs, more extensive advice has been provided by exercise facilitators (Halbert, Silagy et al. 2000; Stewart, Mills et al. 2001) or practice nurses (Sims, Smith et al. 1999; Steptoe, Doherty et al. 1999). The STEPS physical activity intervention assessed the effect of different levels of follow-up support on walking behaviour in older people (Dubbert, Cooper et al. 2002). All participants received brief physical activity advice from a nurse. Participants in the intervention arms either had 20 follow-up telephone calls or 10 calls from the nurse and 10 automated motivational calls. Both groups increased walking over the subsequent 12 months. Automated motivational calls in addition to nurse calls produced positive self-reported physical activity outcomes compared to the control group. No other significant between group differences in health related variables or fitness were found.

The New Zealand Green Prescription scheme allows referral to an exercise specialist employed by the Regional Sports Trusts as part of a Sports and Recreation New Zealand initiative. The program has been thoroughly evaluated and found to have acceptable cost effectiveness and cost utility (Elley, Kerse et al. 2004; Dalziel, Segal et al. 2006). A cluster randomised trial of the New Zealand Green Prescription scheme in 42 general practices reported improvements in physical activity behaviour and health amongst adult participants (Elley, Kerse et al. 2003). The GPs gave brief advice, which took about 7 minutes, then referred the patient to a trained exercise specialist who

provided telephone support over a three month period. In a sub-group analyses of those 65 years and over, a distinct increase in physical activity (average 40 minutes per week more than the control group) was reported at one year post intervention (Kerse, Elley et al. 2005). Improved vitality and general health was also reported (based on the SF-36), plus a decrease in hospitalisations. No increases in falls or injuries resulted from the intervention. Australian GPs now have the option of using Lifestyle scripts for their patients.

Exercise referral schemes have been popular in the UK for some time. Although there are national guidelines for their evaluation (UK Department of Health 2001), the amount of evidence for their effectiveness has been restricted by the lack of systematically occurring evaluation and the limited scope of most evaluations' methodologies. In a critical commentary, Dugdill and colleagues recommended using a participatory action research approach to provide a more comprehensive evaluation of these schemes, incorporating biopsychosocial data, rather than simply demographic and clinical data (Dugdill, Graham et al. 2005). The authors reported on two urban schemes involving several thousand adults. Adherence ranged from 30-45% over a typical 12-week program. They noted that amongst adherers, physical activity did increase on average over a three-month period and was partially maintained to one year, but failed to reach levels sufficient to obtain health benefit. Interestingly, older people (those 60 + years old) were more likely to attend initial assessment and to adhere. There was no assessment of whether this trend was age related, or linked to the reported increased likelihood amongst those with pre-existing chronic conditions.

Since January 2006, Australian GPs have been able to refer patients with chronic and complex conditions to a physiotherapist or an exercise physiologist for physical activity advice, with costs covered by the Enhanced Primary Care Program. Lessons learned from the overseas evaluations will be helpful in shaping the evaluation of this initiative.

The built environment

The importance of a supportive environment is acknowledged. In reviewing environmental and policy interventions, Kahn et al. (2002) found that enabling access to sites for physical activity, accompanied by informational outreach, was successful. Other approaches they reviewed had insufficient evidence to be properly assessed. The focus of the interventions reviewed was upon providing supportive environments and strengthening community action at a structural level. None of the studies specifically evaluated the impact upon the older population, but the increased numbers of people reporting being physically active included older people, thus such models are to be promoted. In Australia, support from the wider community, via media campaigns such as Victoria's 'Go For Your Life' initiative, accompanied by policy and structural changes to facilitate physical activity appear promising, but the evidence base remains limited. Developing the infrastructure to support physical activity programs designed to change individual behaviour is critical. Alongside the reorientation of services, the wider environment in which they are delivered needs consideration. The environment in which older people live plays an important role in determining their physical activity patterns.

One example of such work is the National Heart Foundation's Supportive Environments for Physical Activity (SEPA) Initiative. The SEPA initiative addresses factors that either inhibit or encourage people to lead healthy, socially engaged and physically active lives. The Initiative aims to enable an environment to be created that will encourage all Australians to use their local and regional areas for physical activity pursuits. The Initiative is working towards changing public policy and the planning and design processes that contribute to providing safe and healthy environments for active living. This entails promotion of community development and engagement via the development of urban areas that allow culturally appropriate options for active living. Intergovernmental and intersectoral collaboration to further the development of urban environments are endorsed by SEPA. Partnerships are important: cross-sectoral connections, beyond the health and leisure sectors, are necessary. The following example highlights the importance of incorporating a structural perspective in physical activity promotion initiatives. Schofield and colleagues engaged local councils in promoting dog-walking as part of the

Rockhampton 10,000 steps physical activity promotion campaign (Schofield, Steele et al. 2004). Aside from the modest impact of this scheme amongst residents, the authors noted the challenges of involving the councils in this community education strategy. Physical activity was not seen as a council goal. Discussions led to common ground for communicating with the community, within the context of promoting registration and sensible dog-ownership.

Over the past few decades urban planning has been designed with a focus on automotive transport to connect people with destinations. This has led to housing development that is reliant upon car usage. The current generation of older people includes some who didn't learn to drive and an increasing number who are unable to drive for health reasons. This has major implications for access to services and social connectivity. There is growing awareness that adult pedestrian journeys have an optimal range of around 400m. Ideally, a whole range of services should be available to the resident within this range. Planners are encouraged to develop housing and service centres using a mixed land-use policy, to minimise distances between homes and services. Older people need facilities such as medical centres and post offices to be available in their neighbourhood to assist pedestrian access.

The promotion of 'active transport', that is walking, cycling or using public transport rather than driving to a destination is commendable, but may not be an option for some older people, particularly those living in regional and rural Australia where this infrastructure doesn't exist, and for those with multiple comorbidities. Older people need to feel safe when walking the streets: this is not possible if the council does not properly maintain the environment. Older people need to be able to cross the road safely, yet consumer focus groups often note that the time that lights remain green is insufficient for many older people to cross the road (Wright, MacDouglas et al. 1996). There is a role for local governments in enabling older people's access around their neighbourhood. For example, strategies to minimise uneven pavements and active maintenance programs can be implemented. Access for older people with a range of disabilities can be assisted by providing curbs with ramps or sloping curbs. A Swedish study (Ståhl, Carlsson et al. 2006) used a three stage needs assessment process with a range of stakeholders including older residents in one municipality. Based on the findings, environmental measures such as lowering of curbs, widening of pavements and placing benches along pedestrian routes, were decided upon and implemented by the local municipality. The evaluation of this intervention has just been completed. It will provide some guidance on the feasibility of making environmental changes and their impact on walking behaviour in older people.

Research on the links between the built environment and health, including physical activity promotion, is limited (Handy, Boarnet et al. 2002; Saelens, Sallis et al. 2003). Emerging evidence confirms that access to aesthetically pleasing public open spaces is conducive to higher rates of walking, implying that health gains can be achieved by providing access to such environments (Giles-Corti, Broomhall et al. 2005) (Pikora, Giles-Corti et al. 2006). There remains huge potential for land-use and design policies to improve opportunities for walking and cycling, along with creating more aesthetically pleasing environments in which to do so. The existing evidence base tends to focus on purposeful travel patterns, i.e. to a destination, such as workplace or shops. Data on travel for leisure and physical activity purposes is scarce. Some examples are the United States' Behavioural Risk Factor Surveillance System (BRFSS), the US National Health Interview Survey (NIS) and the US National Health and Nutrition Examination Survey (NHANES), which report a range of leisure time activities (albeit with limited information about older age groups). Although several researchers are documenting physical activity patterns using geographic information systems (GIS) methodologies, further research on travel trends is needed. Data can be collected from existing sources, such as census data, real estate records, public health statistics, and public safety data. Such ecological level information ideally needs to be interpreted alongside individual level data, both from self-report measures and objective measures such as pedometers and accelerometers.

In Australia, consideration of environmental factors extends beyond the built environment to the geographical challenges of rural and remote living. Many rural and remote communities lack the community infrastructure to support sport and leisure activities. This issue is particularly salient for

Aboriginal and Torres Strait Islander communities. Survey data from remote Indigenous communities highlight that the people view recreational facilities as a priority need. Indeed, one Western Australian survey ranked the need for recreational facilities second, behind road access to and from communities (Environmental Health Needs Coordinating Committee 1998). The national Indigenous Sports Program has begun to address some access issues, but its focus is not directly relevant to older people.

5.4 Linking evidence and practice across the individual, societal and structural domains of influence

We have described three levels at which physical activity behaviour is influenced: the individual, the societal and the structural. The bulk of the evidence base has focused on the individual level, supported by theoretical physical activity behaviour change models. However, individuals do not exist in a vacuum. As indicated, factors operating at the societal and structural level mediate physical activity behaviour in older people. Li and colleagues have commented on the scarcity of research using methodologies that collect data across these levels simultaneously, whether cross-sectionally or longitudinally (Li, Fisher et al. 2005). It is important that we use multilevel models and multifaceted data collection methods in order to learn more about the inter-level influences. The conceptual model shown in Figure 5.1, constructed by Li and colleagues (2005), illustrates the multi-level nature of the relationship.

From a population health perspective, making structural changes to the environment is more likely to have a greater reach than programs targeting the individual. People of all ages and levels of activity within a neighbourhood will be influenced by changes to the area. Further, the changes are likely to be maintained for some time, compared to the limited impact of individual level interventions over time. Saelens and colleagues (2003) estimated that the increase of 15 minutes more walking per week seen in those living in areas of 'high walkability', whilst modest at an individual level, translates into significant public health gains.

Although studies empirically examining the link between structural factors and health are few, their numbers are increasing. Recently Frank and colleagues (2004) explored the relationships between urban form factors, physical activity and obesity in a sample of almost 11000 Atlanta US residents who completed a computer assisted telephone interview (CATI). Whilst there was no specific focus on older residents, the findings are relevant. Existing data were used to calculate street connectivity, residential density and land-use mix. Land-use mix was the strongest predictor of obesity (BMI >30 kg/m²). Land-use mix is measured on a scale of 0-1, where 0 equals single usage e.g. residential. An increase from 0.15 to 0.3 (reflective of other regions) would decrease the likelihood of obesity in a population by 5%. Very few reported walking for transport. Each additional km walked per day was associated with a 4.8% reduction in obesity likelihood. In a similar study in Sydney, Wen and colleagues (2006) found a strong relationship between driving to work and the prevalence of obesity. People who drove to work were significantly less likely to achieve recommended physical activity levels compared to non-car users. The risk of obesity increased with age (OR 1.95, 95% CI 1.43-2.65 in those age 60 and over) and was higher in those with lower socioeconomic status (as measured by SEIFA scores) (Wen, Orr et al. 2006). This research provides further level IV evidence that both individual and structural strategies are needed to produce health impacts.

SUMMARY

Individual, societal and structural factors all influence uptake and sustained participation in physical activity. Theoretical frameworks are increasingly being used in physical activity effectiveness studies. Studies incorporating distinct maintenance strategies and evaluation thereof are needed. Further, such strategies need to be multi-level, accommodating societal and structural influences on individual behaviour. Physical activity is increasingly being used in community capacity building strategies, to encourage social connectedness and, for older people, to reduce social isolation.

6 Measurement of physical activity in older people

To determine whether - and how - physical activity interventions are impacting on older people's behaviour and ultimately their health, we need suitable measurement tools. The literature highlights the methodological weaknesses of existing research and discusses the challenges of ensuring the internal and external validity of measurement tools for older people. A methodological review is beyond the scope of this document. A summary of the key issues is given in Appendix 4.

Methodological challenges aside, there is level II evidence for the benefits of exercise across an array of biopsychosocial health outcomes in older people. The challenge for reviewers seeking to conduct meta-analyses is that studies have used a diverse collection of measurement tools for measuring the same outcome variable, making cross study comparison problematic. The outcome variability between and within individuals is further compounded by the variety of activity types researchers have evaluated.

Table 6.1 Common outcome measures and measurement tools used.

Outcome	Variable	Examples of tools
Physiological	Muscle strength	1RM, Dynamometer, Kincom, Cybex
	Endurance/Cardiovascular fitness	Maximum oxygen consumption VO ₂ max 6 minute walk test 10 m shuttle test beep test
	Neuromuscular control	Reaction timer
	Body composition	Skinfold thickness/BMI
Function	Flexibility	Range of motion
	Gait	Walking speed, stride length, cadence, step width
	Balance	Clinical and laboratory tests of static and dynamic balance, single and dual task
	Activity level	Pedometers, Uptimer, activity monitors, Human Activity Profile, PACE
	Activity of daily living	Barthel Index, Katz Index, Lawton and Brody's IADL scale
Health status	Self reported health	SF-12, SF-36, SIP
	Mental health	CES-D, GDS, PGMS, POMS
	Quality of life	AQOL, EuroQoL

Key: CES-D Center for Epidemiological Studies- Depression Scale; GDS Geriatric Depression Scale; PGMS Philadelphia Geriatric Centre Morale Scale; POMS Profile of Moods Scale; SF-36 Short-Form-36 Health Survey; SIP Sickness Impact Profile;

Future research will need to systematically employ well validated, age appropriate measurement instruments. In order to contextualise observed changes in an individual's behaviour, researchers and evaluators need to incorporate both individual level data collection and ecological level data to determine mediators and predictors operating across individual, societal and system levels of influence.

7 A description and critique of existing guidelines and recommendations

A number of countries have introduced physical activity guidelines as part of their physical activity promotion policies. These include Canada, New Zealand and Switzerland. Australia introduced physical activity national guidelines in 1999. Like those of most countries, these were targeted at the adult population broadly, and as such are considered not to address the specific needs of some sub-groups, including older people. Other countries such as Brazil and Scotland have adopted existing guidelines, e.g. American College of Sports Medicine, Centres for Disease Control and United States Surgeon General's recommendations (Pate, Pratt et al. 1995; Mazzeo, Cavanagh et al. 1998). Canada has produced guidelines for population sub-groups, such as children and older people. Australia recently developed national recommendations for children and youth.

All Guidelines and recommendation documents deemed relevant by the project team were evaluated, using the AGREE (Appraisal of Guidelines Research and Evaluation) instrument (The AGREE Collaboration 2001). The AGREE instrument is an instrument designed to provide a standard framework for assessing the quality of clinical practice guidelines. It assesses "both the quality of the reporting, and the quality of some aspects of the recommendations. It provides an assessment of the predicted validity of the guideline, that is, the likelihood that it will achieve its desired outcome. Most of the criteria contained in the AGREE Instrument are based on theoretical assumptions rather than on a empirical evidence. They have been developed through discussions between researchers from several countries who have extensive experience and knowledge of clinical guidelines. Thus the AGREE Instrument should be perceived as reflecting the current state of knowledge in the field (The AGREE Collaboration 2001)(p 2)."

Guidelines and recommendation documents reviewed for this project varied widely in terms of their scope, method of development, target group, method and style of presentation, and some have not been developed as clinical practice guidelines (which is the target of the AGREE document). As such, not all the guidelines and recommendation documents reviewed were able to be fully rated with the AGREE instrument, however, relevant sections of the AGREE instrument were completed for these guidelines and recommendation documents.

The following tables provide details of the physical activity guidelines and recommendation documents reviewed (Table 7.1) and a summary of the AGREE evaluation of the guidelines and recommendation documents (Table 7.2). A summary of the physical activity recommendations for older people derived from these guidelines and recommendation documents appears in Appendix 6.

Table 7.1 Physical activity guidelines and recommendations reviewed.

No	Country	Organisation	Title	Year	AGREE Review rating and relevance
1	Australia	Australian Government Dept. of Health and Ageing	Recommendations for children's and youths' participation in health promoting physical activity http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-pubhlth-strateg-active-recommend.htm	2005	Not directly relevant, though provides useful framework for considering similar issues in older people.
2	Australia	National Public Health Partnership	Getting Australia active II http://www.nphp.gov.au/publications/documents/GAA_2_Body.pdf	2004	Good update of recent research literature (to 2004) on physical activity across the lifespan, though little specifically on the needs of older people or people with disabilities. Provides a useful overall framework for coordination of policy, planning, and research. Rating – Recommend
3	Australia	New South Wales Dept. of Local Government	Creating active communities. Physical activity guidelines for local councils http://www.communitybuilders.nsw.gov.au/building_stronger/vibrant/phys_councils.html	2001	Promotes physical activity across all ages, has separate section for older people, people from CALD backgrounds, and rural and remote areas. Rating-Recommend
4	Australia	Diabetes Australia	National Evidence Based Guidelines for the Management of Type 2 Diabetes Mellitus Part 2 Primary Prevention http://www.diabetesaustralia.com.au/_lib/doc_pdf/NEBG/PP/Part2-Prevention-311201.pdf Part 5 Evidence Based Guideline for the Prevention and Detection of Macrovascular Disease in Type 2 Diabetes (2004) http://www.diabetesaustralia.com.au/_lib/doc_pdf/NEBG/MV/Part5-Macrovascular-180304.pdf	2001	<u>Part 2 – Primary prevention.</u> Not targeting older people specifically, although relevant for older people with diabetes, and some recommendations are relevant for older people generally. Rating – Recommend
5	Australia	Australian Government Dept. of Health and Family Services	Developing an active Australia: A framework for action for physical activity and health http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-pubhlth-publicat-document-active-cnt.htm/\$FILE/active.pdf	1998	One of the earlier documents establishing a national agenda in physical activity across the lifespan. Key strategies identified in the areas of education, environments, infrastructure, and monitoring. Useful framework, though literature substantially out of date. Rating – Recommend
6	Canada	Public Health Agency of Canada	Canada's physical activity guide for healthy active living for older adults http://www.phac-aspc.gc.ca/pau-uap/fitness/pdf/guide_older.pdf	1999	Information guide / booklet for older people. Rating-Recommend
7	South Africa	South Africa Dept. of Health	Guideline for the promotion of active ageing in older adults at primary level http://www.doh.gov.za/docs/factsheets/guidelines/ageing/ageing.pdf	2000	Appears to be aimed at older people and some physical activity providers. Rating – borderline usefulness

No	Country	Organisation	Title	Year	AGREE Review rating and relevance
8	United States of America	National Institutes of Health	Evidence-based protocol. Exercise promotion: walking in elders. http://ngc.org/summary/summary.aspx?doc_id=3074	2002	Protocol targets older sedentary people. Based around the Stages of Change model, provides suggested strategies to increase physical activity (especially walking) at each stage. Rating-Recommend
9	United States of America	The American Geriatrics Society	Exercise prescription for older adults with osteoarthritis pain: consensus practice recommendations http://www.americangeriatrics.org/products/positionpapers/oa_guidelines.pdf	2001	Provides an evidence based summary of the research evaluating effects of physical activity (exercise prescription) for older people with osteoarthritis. Includes discussion of assessment, how to start, basic principles of exercise prescription, and details of progression, dosages etc for flexibility, strength training, and fitness activities. Rating – Strongly recommend
10	United States of America	The National Institute on Aging	Exercise: A guide from the National Institute on Aging http://www.niapublications.org/exercisebook/ExerciseGuideComplete.pdf	1996	Targets older people, written as a guide for older people. Rating- Recommend
11	United States of America	U.S. Dept. of Health and Human Services	Physical activity and health. A report of the Surgeon General. Executive Summary & full report http://www.cdc.gov/nccdphp/sgr/pdf/execsumm.pdf	1996	Has been a landmark document since published 10 years ago. Covers physical activity across the lifespan, though has little emphasis on older people or people with disability specifically. Currently being updated. Rating-Recommend
12	United States of America	U.S. Dept. of Health and Human Services	Physical Activity for Everyone: Recommendations: Are there special recommendations for older adults? http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/older_adults.htm	1999	Useful website link, with information and resources specifically for older people and health professionals. Does not consider issues related to frailer older people / those with comorbidities undertaking physical activity. Rating – Recommend
13		World Health Organisation	The Heidelberg guidelines for promoting physical activity among older persons http://www.who.dk/document/e75205.pdf	1996	Useful, well laid out, though brief framework for supporting improved physical activity through involvement of policy and planning staff and health workers. Rating – Strongly recommend
14	Australia	National Heart Foundation	National Heart Foundation of Australia physical activity recommendations for people with cardiovascular disease. http://www.heartfoundation.com.au/index.cfm?page=42 A position statement on these guidelines has been published in the Medical Journal of Australia (16 Jan 2006): http://www.mja.com.au/public/issues/184_02_160106/bri10727_fm.pdf	2006	Targets people with cardiovascular disease, though much is transferable to other groups with co-morbidities. Rating –Strongly recommend

No	Country	Organisation	Title	Year	AGREE Review rating and relevance
15	United States of America	American College of Sports Medicine	Position stand on exercise and physical activity for older adults (Mazzeo, Cavanagh et al. 1998)	1998	Provides a review of the research evidence on physical activity for older people in five key areas – cardiovascular training, strength training, postural stability and flexibility training, psychological responses to physical activity, and physical activity for the very old and frail. Good summary statement of the evidence at the time of publication (1998), needs to be supplemented with more recent research evidence. Rating – Strongly recommend

Table 7.2 Review of existing physical activity guidelines and recommendations for older people.

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
1. Australian Government Dept. of Health and Ageing – Recommendations for children's and youths' participation in health promoting physical activity	Not reviewed						Structure used as basis for discussion document on physical activity for older people.
2. National Public Health Partnership – Getting Australia active II Targets policy / planning staff, researchers, health care workers, and others with involvement in supporting physical activity across the lifespan.	Stated aims were to update the research literature, identify gaps and recommend on key areas for development and new investment areas in capacity building and health gains, and consultation, in order to develop a national physical activity strategy and action plan.	Collaborative research consortium. Steering group of SIGPAH oversaw the work.	Used Bauman 2002 as basis, so literature only updated from that review. Lists 17 independent reviewers / researchers reviewed specific components of the literature update. Minimal new information on physical activity and older people / CLDB reported / people with disabilities.	Well presented. Includes sections on update of the epidemiological evidence; update of the research on effectiveness of physical activity interventions; review of national strategy related documents; review of international policies on physical activity; and conclusions and recommendations.	Generic for supporting physical activity across the lifespan. Small sections on older people, people with disabilities, and people from CLDB. The chronic disease section is quite limited, covering only overweight and obesity, diabetes, and PRT.	Useful overall document, with quite a number of recommendations that are relevant for older people, even though they have been developed for all ages.	Figure 5.5 – draft schema for structuring the action components of the national physical activity strategy in Australia – has potential to be modified for older people.

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>3. NSW Health (Australia) – Creating active communities: Physical activity guidelines for local councils.</p> <p>Target group is local councils.</p> <p>Guidelines are across all ages (not older people specific)</p>	Objective clearly defined.	Included broad range of stakeholders, including state government, divisions of local government, Heart Foundation, and individual councils. Does not appear to have included older people in the process of development. Does not state if there was any pilot testing of the guidelines.	Describes some research throughout, but does not appear to have utilised a systematic review of the literature. Method of formulating the recommendations is not clearly stated, other than review by relevant individuals on the Working Group. Recommendations are generally in line with the research evidence, though there is limited reference to the specific supporting research evidence. Discusses benefits to councils and wider community of supporting physical activity opportunities for all people (reduced injuries, increased feelings of safety). Key issues and specific risks relating to physical activity for older people are discussed (p 92), and also for other key population sub-groups.	<p>Well structured list of key principles to increase physical activity across all ages (p5): whole of council approach integrated planning safe and supportive environment activities / events / programs special needs groups (including older people) community involvement partnerships ongoing monitoring & evaluation</p> <p>Examples for councils to implement to meet guidelines are described, and case studies provided.</p> <p>In house training package included for council staff.</p>	<p>General physical activity recommendations are provided across all ages, many have direct implications for older people and people with disabilities.</p> <p>No criteria for ongoing review provided.</p> <p>Highlights key issues for older people (p92): increased risk of injury living alone / limited social networking and opportunities cost issues transport issues fear of crime.</p> <p>Has a section also on CALD populations (p108), and rural and remote (p 112).</p>	Provides useful framework for councils to consider ways to support physical activity in their communities, which should be more widely generalisable.	<p>Key principles (p5) provide a useful framework for organisations to consider their role in promoting physical activity.</p> <p>Highlights importance of ensuring terminology used in promoting physical activity for older people needs to be tailored to what older people perceive to be relevant and important.</p>

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>4. Diabetes Australia. National Evidence Based Guidelines for the Management of Type 2 Diabetes Mellitus Part 2 Primary Prevention</p> <p>Target group is those with diabetes, and health practitioners working with them.</p>	<p>Aims to inform and guide health promoting and preventive activities for Type II diabetes with evidence based information on the effectiveness of non-pharmacological interventions. Guidelines are directed to clinicians, health promotion practitioners, policy makers and policy planners. Main focus on 1:1 interventions.</p>	<p>Expert Group of researchers, practitioners, and professional organisations.</p>	<p>Strong methodology, double review of database searches, double review of most identified research articles. Key issues were identified by the Expert Group. Each issue was supported (based on research evidence) with recommendations, evidence statements, background evidence, summary and evidence tables.</p>	<p>Well structured guidelines. A possible limitation for practitioners is the large amount of detail of the supportive research evidence for each section – this might be better presented as a brief snapshot / plain language summary of the research.</p> <p>Recommendations are clearly identifiable. No implementation tools are provided.</p>	<p>Highly applicable for people with diabetes, some applicability and generalisability to the older population generally, and particularly older people with diabetes.</p>	<p>Not targeting older people specifically, but relevant for older people with diabetes, and some recommendations also applicable to the wider population of older people.</p>	<p>Highlights the need for further research evaluating the impact of psycho-social stress or major depression as triggers in increasing the risk of type II diabetes. Also raises the question of whether physical activity outcomes vary for diabetics of differing CLDB.</p>
<p>5. Australian Government Dept. of Health and Family Services – Developing an active Australia: A framework for action for physical activity and health</p> <p>Targets all Australians</p>	<p>Developed as part of the Active Australia initiative, based on the US Surgeon General's findings and report.</p>	<p>Commonwealth and State / Territory health authorities and experts in some areas of physical activity were involved. Initially involved a national symposium, and a subsequent workshop.</p>	<p>Experts, policy and planning staff, and researchers involved. Does not appear to have involved a systematic review. Includes a brief research summary. References cited throughout. Key strategies in a separate section, not directly linked to the supporting evidence. Was externally reviewed by two experts.</p>	<p>Generally well presented. The majority of the recommendations are quite general, difficult to implement and monitor. However, reported a plan for an evaluation in 2000, and that baseline measures in physical activity for comparison had already been established for future comparisons.</p>	<p>Generic for supporting physical activity across the lifespan. Minimal of direct relevance to older people, however a number of the strategies are applicable to older people.</p>	<p>Useful brief summary throughout of key actions to support increased physical activity.</p>	

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>6. Public Health Agency of Canada</p> <p>Physical activity guide to healthy active living for older adults.</p> <p>Written for older adults.</p>	Identifies rationale for being / becoming active. Puts strong emphasis on link between physical activity and independence, as well as physical and mental health and quality of life.	Stakeholder involvement in development not stated, however the information booklet has been endorsed by extensive range of stakeholders (p 22).	Development process not stated.	Most recommendations are clearly stated, and supported with statements of likely benefit. Four groupings of physical activity described (endurance, strength, balance, flexibility). Note- combines discussion of balance and strength activities, with focus largely on strength activities (p 8). Would benefit from greater discussion of balance activities.	Good discussion of barriers to taking up and sustaining a physical activity, and tips provided to overcome these. A range of useful tools included in the booklet, including checklists, posters, a physical activity diary for completion to monitor progress, and case studies.	Well written, plain language booklet promoting both incidental and formal physical activity options. Strong focus on effect of physical activity on independence.	Posters, activity diary.
<p>7. Dept of Health, South Africa</p> <p>Target group not clearly defined, but appears to be mostly consumers / older people</p>	Objectives defined, although very general. States main target group is people over 60 years, but also defines a broad range of other groups who could be targeted for education / training / special at risk groups, who could be involved with the active ageing	Broad listing of stakeholders consulted (p23), including policy and planning staff, researchers, & non-government organisations (though which ones is not stated). Doesn't list older people on the list of key stakeholders. Does not state if	Not stated	Recommendations are not clearly separated from other text. Very broad coverage, divided into 3 main types of physical activity (cardio-respiratory, strengthening and balance). Has a general set of exercises included, but are quite a low level of challenge.	Some points are made to support facilitation of participation (p 22).	Borderline usefulness overall	Lists range of medical conditions for which physical activity should only be undertaken with medical supervision (p5, 8). Lists range of risk factors which if present should be screened by a medical practitioner before commencing physical activity (p5, 8).

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
	program.	there was any piloting of the guideline.					
8. Evidence-based protocol. Exercise promotion: walking in elders.	Objectives defined. Aims to provide health care providers with information and strategies to support increased walking among older people.	Stakeholder involvement not defined in summary document.	Based on a systematic review and evidence based grading of the research literature. Criteria for inclusion / exclusion of studies not provided. Reviewed by series editor for the guidelines, and two content experts.	Main part of the document is broken down into recommendations to support increased walking, under headings of each level of the stages of change model. Includes a number of tools to assist implementation, including an exercise promotion knowledge assessment for staff (pre and post education program), a process evaluation monitor, an exercise promotion outcomes monitor, physical activity stages of change questionnaire, physical activity readiness questionnaire, and a balance test.	Useful framework for health care providers. Useful tools to support implementation. Lists parameters of walking programs to be monitored (intensity, duration and frequency of walking).	Strong focus on stages of change model, and provides suggested strategies to support physical activity (especially walking) for older sedentary people. Useful resource.	An exercise promotion knowledge assessment for staff (pre and post education program), a process evaluation monitor, an exercise promotion outcomes monitor, physical activity stages of change questionnaire, physical activity readiness questionnaire, and a balance test.

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>9. The American Geriatrics Society. Exercise prescription for older adults with osteoarthritis pain: consensus practice recommendations.</p> <p>Targets health practitioners involved in management of older people with osteo-arthritis</p>	<p>Targets older people with osteo-arthritis, though identifies that over half of all people aged over 65 are affected by osteo-arthritis. Highlights the importance of physical activity in this target group in combination with other management modalities including medication and education.</p>	<p>Panel of experts from many disciplines including geriatrics, internal medicine, orthopaedics, physical therapy and rehabilitation, exercise physiology, nursing and pharmacy.</p>	<p>Developed based on literature review, and consensus from expert multidisciplinary panel. External review of final draft.</p>	<p>Well organised. Provides review of literature, then sub-sections on:</p> <ul style="list-style-type: none"> - benefits of physical activity for OA patients; - assessment and exercise prescription, including details of starting, and progressing flexibility, strengthening and fitness activities. 	<p>Directly applicable to older people with osteoarthritis, and likely to be generalisable to some other health conditions. Has emphasis on health professionals assessing and guiding physical activity program together with other elements of care (eg education, medication).</p>	<p>Good review of research evidence and practical guidelines for practitioners in helping older people with osteoarthritis to commence and progress physical activity options. Focus on more structured physical activity options.</p>	<p>Provides an algorithm for Steps in managing osteoarthritis in older people, highlighting the important role of physical activity (p 816).</p>
<p>10. NIH</p> <p>Targets consumers / older people</p>	<p>Objectives and target group well described.</p>	<p>Primarily (very experienced) researchers involved in development. Does not appear to have been reviewed by older people / consultation group or having been piloted. Target users clearly defined.</p>	<p>Strong team of researchers developed the guide. Evidence based, but criteria for selecting evidence and method of formulating evidence not described. Good discussion of risks, but tends to be limited to a small number of clinical conditions. No external review or updating procedure reported.</p>	<p>Recommendations not clearly identified, mixed throughout text. Detailed, but simple, non technical language. Provides examples of different types of exercise – generally good, although balance exercises are limited to mostly modified strengthening exercises. Includes tools for monitoring progress and facilitating motivation.</p>	<p>Considerable discussion of factors facilitating and barriers to uptake and sustained engagement in physical activity.</p>	<p>Generally very good. Perhaps is most useful for older people without many co-morbidities. Perhaps needs stronger focus on incidental activity, and group approaches to physical activity (eg tai chi).</p>	<p>Sample exercises, useful tip sheets (in the appendix), daily and weekly activity calendars, monthly progress records, and resource list.</p>

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>11. U.S. Dept. of Health and Human Services: Physical activity and health. A report of the Surgeon General.</p> <p>Targets practitioners, researchers and policy planners, to support increased physical activity across the lifespan.</p>	<p>Aims to summarise the existing literature (1996) on the role of physical activity in preventing disease. Has a general focus across the lifespan. States (p4) that "a review of the special concerns regarding physical activity for ... people with disabilities is not undertaken here."</p>	<p>Large number of contributors, mainly academics and researchers, small number of representatives involved from other stakeholder organisations (eg American Alliance of Health, Physical Education and Dance).</p>	<p>No formal systematic review of the research literature undertaken, relied on researcher knowledge of research base. Had an expert Group, and a range of expert reviewers. Recommendations were included dependent upon Expert Group's endorsement of "strong evidence base". Is currently being updated. Adverse events were considered in the document.</p>	<p>Well presented document. Moist information is generic, but a small amount of information is provided about specific sub-groups, including older people. No additional tools provided to support implementation.</p>	<p>Chapter 6 is devoted to understanding and promoting physical activity behaviours. There is a small section in this chapter on older people.</p>	<p>Was a landmark document when first published in 1996, still often referred to as a benchmark. Useful framework for considering key issues in physical activity across the lifespan., though little emphasis on older people, and those with disability. There is a considerable volume of research literature that has been published since this document was published, which is likely to impact upon key recommendations. Currently being updated.</p>	

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>12. U.S. Dept. of Health and Human Services – Centre for Disease Control and prevention (website).</p> <p>Targets older people.</p>	Not stated.	Not stated	Not stated, but appears evidence based.	Well presented, simple messages.	Has a section specifically asking “Are there special physical activity recommendations for older people?”	Useful brief summary, targeting older people	Website also includes other useful information, including commonly used terms, tips forgetting started (not specific to older people), and resources for health professionals.
<p>13. World Health Organisation – The Heidelberg guidelines for promoting physical activity among older persons.</p> <p>Targets policy & planning staff and health workers with a role in promoting physical activity to older people.</p>	Aims to provide guidelines for facilitating development of strategies and policies in both population and community based interventions aimed at maintaining / increasing the level of physical activity for older adults.	Method of development not stated.	Evidence based, though not clear what processes were involved in development.	Simple, well designed framework. Minimalist approach with recommendations.	Very relevant.	Useful though brief framework for promoting physical activity for older people.	Health gradient schematic (p 8). List of barriers (though no list of potential solutions).

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
<p>14. National Heart Foundation of Australia</p> <p>Targets health care providers involved in providing physical activity recommendations for people with cardiovascular disease.</p>	Purpose and scope well defined.	<p>Broad range of health professionals on expert working group. Does not appear to have been focus group tested; nor other strategies used to obtain patient's perspective. Target users well defined.</p>	<p>Based on NHMRC levels of evidence, though details of paper review process not provided, nor is the process for selecting evidence detailed. The literature review was limited to key national and international publications since the US Surgeon General's report (1996). Recommendations were developed using an evidence based consensus approach, with guidance from an expert working group, and consultation with major stakeholders. Considerable emphasis placed on precautions / contra-indications to physical activity. Notes the low level of risk associated with walking, gardening and cycling. Medico-legal considerations and risk of adverse events during physical activity are discussed (p 17). Provides a summary table of recommendations (p8) and level of evidence, and has</p>	<p>Generally good clarity and presentation. Relates frequently to recommendation of 150 minutes physical activity / week. Management options for main clinical groups (of cardiovascular health conditions) are provided. Has a range of support tools including safety advice when undertaking physical activity, a grading for heart failure, key components of successful physical activity strategies, and an algorithm for implementation of physical activity for people with cardiovascular disease.</p>	<p>Discusses issues general practitioners need to consider to facilitate uptake of physical activity in this at risk group. Also discusses adverse events and medico-legal considerations (p12).</p>	<p>Generally good structure, moderate evidence base though not an extensive literature review. Useful algorithm to support engagement in physical activity (p 32). Practical application framework using 5A's approach (Appendix 4). Includes recommended actions for GPs to support increased patient physical activity (p 20). Covers broad range of cardiovascular related co-morbidities, with considerable relevance to other groups with moderate levels of co-morbidities.</p>	<p>Algorithm (p 30) very useful.</p>

Guideline	AGREE – Scope and purpose	AGREE – Stakeholder involvement	AGREE – Rigour of development	AGREE – Clarity and presentation	AGREE – Applicability	AGREE – Overall assessment	Any useful info for recommendation document
			supportive text and references in latter part of document.				
<p>15. American College of Sports Medicine Position Stand on exercise and physical activity for older adults.</p> <p>Targets practitioners, policy and planners involved in physical activity promotion for older people.</p>	<p>Purpose not stated overtly, though provides an endorsed position and recommendations for physical activity for older people by the American College of Sports Medicine.</p>	<p>Written by high profile researchers in the area of physical activity and older people, and reviewed and endorsed by ACSM members, the Pronouncements Committee, and by independent experts not involved in development of the Position Stand.</p>	<p>Extensive review of research evidence, although processes for literature searching / retrieval not described.</p>	<p>Well structured, with a brief summary of the research literature, and then recommendations, in each of the five key areas: cardiovascular training strength training postural stability and flexibility training psychological responses to physical activity, and physical activity for the very old and frail.</p>	<p>Highly applicable, for well older people as well as those with multiple health problems and frailty.</p>	<p>Good summary statement of the evidence at the time of publication (1998), needs to be supplemented with more recent research evidence.</p>	

SUMMARY

Many guidelines and recommendations exist for physical activity generally (which include at least a section related to physical activity for older people), and in a few instances, are specifically targeting older people. The guidelines and recommendations vary as to their target audience, rigor of development process, and format. A summary of potential recommendations and support information derived from the reviewed guidelines are included in Appendix 6.

8 Physical activity options for older people: Types and doses

It is acknowledged that older people are a heterogeneous group. Thus the preferred options of physical activity for any one individual will depend upon a range of factors including their health status and their readiness to adopt physical activity behaviour. Older people commonly want to know what they need to do to attain the health benefits discussed in Chapter 3. As implied in Chapter 5, it is not sufficient to simply advise older people to be physically active. People want to know what type of physical activity to do, to what intensity, for how long and how often. Our efforts to answer these queries are limited by the existing evidence base. An overview of the literature about the types and amount of physical activity suitable for older people is provided in this Chapter. Chapter 9 gives an update of the information available about physical activity for particular sub-groups of the older population, including those with one or more of the health conditions addressed by the National Health Priority Areas.

8.1 Volume

The amount of activity conducted is measured across three domains: frequency, duration and intensity. Research has tended to focus upon differing intensities, rather than the frequency or duration of exercise.

In terms of mortality rates, observational studies indicate there is an inverse linear dose-response relationship between the *amount* of physical activity and all-cause mortality (Lee and Skerrett 2001) and cardiovascular disease incidence and mortality, but no strong evidence for stroke incidence and mortality (Kohl 2001). A linear relationship between physical activity level and quality of life was reported by Kesaniemi et al. (2001). These systematic reviews included studies from Canada, Denmark, Finland, Germany, Israel, Italy, the Netherlands, Norway, Sweden, the United Kingdom and the United States. The reported relationships were seen across men and women and younger and older adults. In Lee and Skerrett's analysis (2001), minimum adherence to the American College of Sports Medicine (ACSM) guidelines was associated with a 20-30% reduction in all-cause mortality. There was some support for reduced risk even below the guideline activity threshold.

There is level II evidence that a lower intensity home based program was as effective as a higher intensity program in improving functional capacity in middle aged adults (King, Haskell et al. 1991). Low intensity activity may produce some health benefits, but researchers recommend a progression to moderate intensity activity to optimise the health gains (Cress, Buchner et al. 2005). Generally speaking, the greater the usual energy expenditure, the lower the risk of all-cause mortality, after controlling for several confounding risk factors (Kesaniemi, Danforth Jr et al. 2001). The necessary intensity or 'dose' of physical activity to improve health or quality of life remains unclear (Spiriduso and Cronin 2001). The physical activity threshold, in terms of intensity, duration and frequency, to reduce cardiovascular risk, is inconclusive (Kohl 2001). Several authors have reported a dose-response pattern (Morss, Jordan et al. 2004; Seynnes, Fiatarone Singh et al. 2004) for certain health outcomes (e.g. depressive status). A number of researchers have used low intensity activity, such as flexibility exercises as a control group (Binder, Schechtman et al. 2002). Fiatarone Singh (Fiatarone Singh 2002) comments:

'The lack of appreciable objective benefits from low-intensity exercise (as commonly prescribed to older or frailer adults) should dissuade healthcare professionals from using doses and modalities of exercise that are below the threshold required for physiological adaptation or therapeutic efficacy, even if they seem harmless. The lack of perceived efficacy from such low-intensity regimes can only serve to undermine the promotion of exercise as medicine and lead to dropout and discouragement on behalf of both patient and practitioner' (pg 2089).

In terms of frequency, Perri and colleagues reported that more frequent exercise – 5-7 days vs. 3-4 days/week – resulted in greater total weekly physical activity without affecting attrition rates (Perri, Anton et al. 2002). For duration, there is emerging evidence concerning the protective capability

of small bouts (less than 30 minutes) of physical activity. 'Snackercise', or accruing small snacks of activity, e.g. walking for as little as 10 minutes, may be as beneficial as longer duration activity (Murphy and Hardman 1998). Coleman and colleagues demonstrated that incremental activity, in blocks of as little as 5 minutes, can produce health benefits (Coleman, Raynor et al. 1999). This cumulative approach is likely to increase physical activity adherence (Dunn, Marcus et al. 1999). Others have reported that stair-climbing in up to six two minute episodes throughout the day can have similar health protective effects to one session of longer duration (Boreham, Wallace et al. 2000). An article from the Womens Health trial (Lee, Rexrode et al. 2001) revealed that *time spent walking*, rather than walking *pace* was predictive of reduced risk. At least one hour of walking per week was associated with lower CHD rates in these relatively sedentary women. The inverse association was even seen in those at high risk for CHD (e.g. with raised cholesterol levels, overweight and/or smokers). This evidence has guided the change in the message promoted by many physical activity guidelines, including the Australian National Physical Activity Guidelines (Department of Health and Aged Care 1999), that advocate individuals to accumulate at least 30 minutes of moderate-intensity physical activity throughout the day. This approach also reflects an attempt to make physical activity adoption more palatable in order to engage the most sedentary population groups, including older people, who have the most to gain from small changes to their lifestyle (Ekkekakis and Petruzello 1999).

The move to promote moderate intensity physical activity is supported by level III evidence from the American Women's Health Initiative program (Manson, Greenland et al. 2002). Women who walked briskly *or* exercised vigorously at least 150 minutes per week had a risk reduction of about 30% for coronary disease. Compared to women who never or rarely walked, women who walked briskly had decreasing levels of risk (Table 8.1). Those who spent less time sedentary (categorised in hours spent sitting, lying down or sleeping) also tended to be at less risk. A large European case-control study confirmed the protective impact of physical activity for development of myocardial infarction (D'Avanzo, Santoro et al. 1993). The protection obtained from moderate intensity physical activity was similar to that from vigorous exercise. These findings are encouraging, given that moderate activity is likely to be more sustainable in older people.

Within a particular type and level of physical activity, the appropriate intensity for an individual will vary dependent upon a number of factors including health status and previous exposure to that activity. For example, a walking activity of moderate intensity might require walking briskly at 50 metres/minute for a well older person, whereas a frail older person with multiple health problems might find a walking activity at 10 metres/minute to be of similar self perceived (moderate) intensity. Therefore, intensity needs to be considered in the context of individual factors/differences.

Table 8.1 Influence of walking pace on coronary disease risk.

Pace	3.2-4.8 km/hr	4.8-6.4 km/hr	>6.4 km/hr
Relative risk *	0.86	0.76	0.58

* compared to those who never or rarely walked, RR 1.0

Source: Manson 2002

Getting the physical activity message translated into action is clearly important. There is level II evidence, albeit in adult women, that the 10,000 steps message may be more productive than general advice to walk. Hultquist et al. (2005) conducted a trial where women were randomized to two message delivery modes: 10,000 steps per day or brisk walking for 30 minutes most days of the week. Participants were those walking 7000 steps or less in the run-in period. Both groups received closed pedometers to monitor actual steps taken. The steps group also wore a pedometer they could read. Both groups received weekly social support when they exchanged their pedometers. The steps group achieved the steps target and walked more on all days than the brisk walking

group. Whilst the brisk walking group got close to this target on days they took exercise, this was not so on days they didn't. The generalisability of the findings are limited by the participants' homogeneity (they were largely overweight and Caucasian) and the short trial period (4 weeks). The authors point to several benefits of the step message: its specificity, and the motivating and adherence effects. The impact appeared to influence physical activity behaviour throughout the week, enabling greater integration of walking into daily life.

Table 8.2 summarises the current considerations regarding dosage of the different types of physical activity.

8.2 Types of physical activity

Physical activity encompasses exercise and incidental activity. Activities for older people can be broadly categorised as i) aerobic, endurance, ii) resistance or iii) mobility promoting and balance. A wide range of activities has been trialled with older people, from aquarobics through to yoga. The current guidelines recommend integration of physical activity into everyday life. Encouraging more 'incidental activity' is an approach that appears well suited to older people, who may prefer this to structured exercise programs (Dunn, Marcus et al. 1999). The following sections provide an overview of the different types of physical activity. The current consensus amongst physical activity experts is that a multidimensional program that includes all types of physical activity is optimal for functional and health benefits for older people in general (Cress, Buchner et al. 2005). Programs often employ multi-purpose exercises. There is a degree of specificity in some of the health benefits associated with particular types of physical activities. For example, it appears that physical activities with a balance component are more likely to improve balance and decrease falls, relative to other types of physical activity (Province, Hadley et al. 1995). Where a particular health outcome is required, a more specific program of exercises may be implemented. Each of the types of physical activity described below may be undertaken as:

- structured activities such as strength training, tai chi or other group exercise activities, walking groups, hydrotherapy classes (exercise in water) and yoga. Many of these activities can be done in a group setting, or can be done alone at home;
- leisure pursuits that involve physical activity, including golf, lawn bowls, bocce, and various types of dancing (for example, ballroom dancing, line dancing);
- incidental activity, which includes all the routine activities which can be performed as part of everyday lifestyle, that are of a moderate intensity, for example housework, walking to the local shop instead of driving, gardening and raking leaves, and vacuuming;
- supervised physical activity (for example, supervised by a physiotherapist or exercise physiologist), which may be of benefit for older people with moderate health problems, at least when starting out. Examples of older people who may benefit from supervision at least when commencing physical activities are those with heart problems, including following heart surgery; people with neurological problems such as stroke and Parkinson's disease; people with moderately severe arthritis; and those with high risk of falls.

Chapter 9 provides examples of physical activity options that have been successful with different groups of older people.

Table 8.2 Illustrative Components of Fitness and Physical Activity Programs.

	Lifestyle/Incidental	Endurance ²	Strength	Flexibility	Balance
Frequency (days/wk)	5 – 7	5 – 7	2 – 3	2 – 3	1 – 7
Intensity	Moderate	12 – 14 RPE, somewhat hard; 40 – 60% estimated HR _{max}	Resistance to movement that overloads with greater resistance has a greater effect.	To point of resistance or mild discomfort.	Progress difficulty by decreasing support as competence increases.
Volume	At least 30 min accumulated in bouts of 10 min or longer	At least 30 min	2-3 sets, 10-12 repetitions; 4 upper (biceps, shoulder flexion, chest press, back row) and 4 lower body (hamstrings, quadriceps, leg press, calves).	10-30s, progressing longer if desired. Repeat 3-4 times for each stretch. Areas to include: chest, neck ROM; hands, triceps, hamstrings, quadriceps, and hip flexors; calf soleus, gastrocnemius.	Dynamic, focus on mobility; static, focus on 1-leg stance. 4-10 different exercises are available.
Special instructions	Incorporated into or added to the endurance volume for long-term adherence.	Weight bearing encouraged. Increase duration (≥ 30 min) before increasing intensity up to moderate.	Sets separated by 1 min, sessions separated by 1 day. Options: free weights, machines, elastic resistance bands, and callisthenics.	No bouncing. PNF technique. Incorporate into lifestyle, e.g., gardening and putting away dishes on high and low shelves.	Incorporate into lifestyle, e.g., balance exercise while standing in line, performing other tasks. Environmental safety important.

Note. HR = heart rate; ROM = range of motion; PNF – proprioceptive neuromuscular facilitation; RM = repetition maximum; RPE = rate of perceived exertion.
Source: Cress et al., 2005

² For selected older adults for whom vigorous exercise is appropriate and desired, the guideline for vigorous activity is at least 20 min 3 times/week (U.S. Department of Health and Human Services, 1996)

Aerobic, endurance exercise

Aerobic or endurance exercise is defined as continuous movement involving large muscle groups that is sustained for a minimum of 10 minutes (Pate, Pratt et al. 1995). Aerobic activity such as cycling, swimming and walking has featured in a range of physical activity programs for older people. Household activities such as mowing lawns, cleaning floors and washing windows can also be classified as aerobic activities. Progression can be monitored by measuring exertion using a tool such as the Borg Rating of Perceived Exertion scale (Borg 1970) or by simply reducing intensity level when it becomes difficult to talk during the activity (although this test has limitations in those with respiratory impairments). Aerobic exercise may be unsuitable for some older people, for example where there are many comorbidities, or some unstable cardiovascular disorders such as recent myocardial infarction, unstable angina, uncontrolled arrhythmias, third degree heart block and acute congestive heart failure (American College of Sports Medicine 1998).

Progressive resistance training

Progressive resistance training (PRT) offers an alternative form of physical activity for older people. It has been particularly successful in ameliorating muscle weakness in older people. A decrease in muscle mass and muscle strength is a function of the ageing process, but can be exacerbated by chronic health problems. The weakness contributes to falls and fracture risk and overall disability. There has been substantial research into whether PRT can improve muscle strength and physiological function. An early trial in a sample of frail older nursing home residents achieved significant improvements in muscle strength, gait, and habitual activity level (Fiatarone, O'Neill et al. 1994). The improved muscle strength findings in this seminal research have subsequently been confirmed in several other studies (Mihalko 1996, McMurdo 1994, Brill 1998). The evidence for strength training was recently reviewed by an Australian group (Dodd, Taylor et al. 2004) who identified 50 RCTs. A Cochrane review (Latham, Anderson et al. 2003) of PRT for physical disability contained 31 RCTs. Cyarto et al's update (2004) identified four further papers and in our search we identified 2 recent papers. The interventions were largely held at external venues, although three were home based. Programs lasted from two weeks to two years.

The reported gains in muscle strength obtained via PRT can impact positively upon functional capacity, improving overall health. However, the evidence for functional health benefits from PRT is more equivocal, partly due to methodological weaknesses. In their review, Barry and Carson (2004) argue that the tasks undertaken in resistance training for older people need to closely match the functional tasks intended to be improved in the older person. The physiological arguments they forward are beyond the scope of this document. In general, due to reduced neuromuscular plasticity in older people, the physical skills learnt are not as generally transferable as in younger people. For functional health gains then, these authors argue that intensity is probably less important than frequency, so that muscles get used to working in a particular way. Intensity is more important for strength gains, so for tasks that particularly need strength, the dosage will be also be of relevance.

There are encouraging trends for balance, gait and ADL outcomes using PRT. Jette's and colleague's (1999) home based PRT trial involved 3 sessions/week with Therabands™ over 6 months. The program had good adherence (89%) and clinically significant improvements in leg strength, tandem gait and disability at six months. Simons and Andel (2006) trialled PRT in older people living in supported residential accommodation. Their mean age was 83.5 years and only five of the 64 participants were less than 75 years old. Compared to a control group, significant improvements in upper and lower body strength were reported, plus agility, balance and coordination. Few studies have focused on PRT's impact on quality of life or disability outcomes, but the results have generally been favourable (Latham, Anderson et al. 2003). Further research is needed to extend this evidence base.

We have some evidence that physical activity intensity influences the outcome achieved with PRT programs. A small trial using PRT indicated that high intensity training was needed to optimise

strength, power and functional gains in older men (Fatouros, Kambas et al. 2005). The authors reported that the higher intensity program aided maintenance of the benefits over time, whereas they disappeared with the lower intensity program. Nevertheless, lower intensity training produced strength gains that were maintained for 4-8 months. Where this is the desired outcome, a lower intensity program may suffice. Intensity has also been shown to influence mental health outcomes. For depression management, higher intensity PRT may be necessary. For example, Singh et al. found a 50% reduction in depressive symptoms in most (61%) of their high intensity group (Singh, Stavrinou et al. 2005) (Rf Chapter 9) whereas the reduction in the lower intensity group was much smaller (29%). In contrast, both high intensity and variable intensity PRT were found to improve measures of mood amongst sedentary, healthy older people (McLafferty, Wetzstein et al. 2004). There were also gains in strength and lean body mass.

Whilst many PRT programs have included healthy older people, benefits have also been seen for those with chronic disease (e.g. osteoarthritis and chronic heart failure) and disability (Latham, Anderson et al. 2005).

Mobility promoting and balance exercises

Balance is the ability to maintain control of the body over the base of support so as to avoid falling (Cress, Buchner et al. 2005). Most of the evidence regarding balance programs comes from the falls prevention literature in the community setting. Some studies have used specific balance activities, although improvements in muscle strength and endurance can also improve balance. In a meta-analysis of the Frailty and Injuries: Cooperative Studies of Intervention Techniques, only those programs that incorporated a balance component were shown to reduce falls (Province, Hadley et al. 1995). More recently, a number of different approaches have been used to improve balance and reduce falls, including home exercise programs (Campbell, Robertson et al. 1997; Robertson, Campbell et al. 2002), group exercise programs (Day, Fildes et al. 2002; Barnett, Smith et al. 2003; Lord, Castell et al. 2003) and Tai Chi (Wolf, Barnhart et al. 1996; Li, Harmer et al. 2005). In all instances, these programs also incorporated some level of balance activity. These programs have usually resulted in improved balance, strength, gait and function, in addition to reducing falls.

Tai Chi is a form of physical activity that involves balance, strength, coordination, and flexibility. Tai Chi is becoming a more popular form of physical activity in Australia. There are a number of different types of Tai Chi, including variations in terms of the individual styles, the number of forms (movements) learnt, and the degree of physical difficulty involved. Tai Chi for Arthritis is a modified form of Tai Chi which appears more suitable for older people with arthritis and other health problems, which has been shown to improve balance and function (Song, Lee et al. 2003). Several reviews have reported on the effectiveness of various styles of Tai Chi in improving leg strength, trunk flexibility and static standing balance (cardiovascular fitness, pain and mood benefits have also been noted) (Li, Hong et al. 2001; Wu 2002). The generalisability of the findings is limited: most samples have been healthy older people and most of the research has been observational or quasi-experimental in design.

Other forms of physical activity that incorporate balance and mobility (eg dancing, yoga, lawn bowls, golf) may also achieve positive health outcomes, although there have been few randomised trials, particularly with older people, evaluating these approaches.

Decreased flexibility is involved in the aetiology of a range of physical impairments. Loss of flexibility occurs as we age, although to date no causal relationships have been determined. Degenerative changes are exacerbated by disuse and the development of osteoarthritis, osteoporosis and atherosclerosis. Age related changes in musculoskeletal tissue and increased incidence of joint pathology can negatively affect joint extensibility and stiffness. Flexibility exercises have been recommended to be performed at least twice a week, as unique exercises or as part of a physical activity program (Cress, Buchner et al. 2005). Overall, physical activity interventions emphasising flexibility have demonstrated positive effects on older people's range of movement (ROM) and physical function, even in frail older people (McMurdo and Rennie 1993). A review of flexibility and

physical function in older people noted the paucity of evidence about specific or general physical activity programs to improve joint flexibility (Holland, Tanaka et al. 2002). The authors provide an overview of the evidence, focusing on the range of motion (ROM) outcomes documented. In a physical activity calisthenics trial to influence spinal and knee flexion and knee extension ROM, no changes were seen for knee ROM, but spinal flexion improved by 7%, a clinically significant change. In a small RCT, supervised flexibility exercises three times a week for 10 weeks produced significant spinal flexion (25%) and extension (40%) improvements, compared to in the control group (Rider and Daly 1991). One additional benefit of stretching and flexibility exercises that has been reported is an improvement in pain (King, Pruitt et al. 2000), a symptom that impacts on many older people and clearly influences quality of life. The unique impact of this particular type of training cannot be readily established, since most programs use stretching as part of their warm-up and cool-down phases. However, more research of this nature is needed, using specific flexibility training protocols.

SUMMARY

All three broad categories of activity - aerobic, resistance and mobility/balance - have demonstrated health benefits (Hillsdon, Foster et al. 2005) and can be promoted amongst older people. While much of the research evidence regarding health benefits relates to older people living at home, a small but growing research base indicates benefits can be achieved in frailer older people living at home or in residential care. Interventions to increase physical activity have varied in the amount of activity given and the duration of follow-up. Future research is needed to elucidate the types, frequency and intensity of exercises that provide optimal benefit.

9 Physical activity considerations for population sub-groups

In this Chapter, we discuss the evidence for physical activity interventions conducted across a range of older people, including the chronologically 'old-old', frail older people, those with disabilities and those with one or more of the health conditions covered by the National Health Priority Areas.

The WHO Heidelberg guidelines (1997) identify three groups of older people along the health-fitness gradient:

- the physically fit-healthy
- the physically unfit-unhealthy but independent living and
- the physically unfit- unhealthy and dependent individuals.

To these categories, we would add :

- the physically unfit yet currently healthy.

Within each of these categories, people may be either sedentary or physically active. Health benefits can be gained by older people in any of these groups, although the types and intensity of physical activity will differ between groups.

9.1 *The old- older person*

This categorisation spans all four of the WHO classes, although the focus tends to be upon the physically unfit- unhealthy and dependent individuals. Physical activity considerations for this group are encompassed within the following sections, as physical activity involvement is largely determined by health status rather than chronological age.

Whilst many studies have considered older people on aggregate, the Zutphen Elderly Study looked at physical activity patterns across different age groups in their cohort (Bijnen, Caspersen et al. 1998). There was an age-related decline in physical activity, with walking contributing more to overall activity amongst the oldest age group. This was not wholly related to functional decline. However, as the authors noted, with slowing down of routine actions and the potentially greater effort needed to conduct them, the time available for incidental activity and the associated motivation required may lead to less overall activity. This has implications for measuring only incidental activity in studies of older people. It also points to a tendency for reduced diversity of activity with ageing: strategies to promote different forms of activity are particularly pertinent for the old-old. Relatively few intervention studies have focused on the old-old. Simons and Andel (2006) trialled two types of supervised exercise in people with a mean age of 83.5 years. They found similar levels of improvement in functional status (albeit with no between group analyses) amongst those who followed a walking program and those completing a PRT program. For some frail older people, the walking may be a more feasible option in the long term, although they may require initial lower limb strength training to enable independent walking.

It has been difficult to disentangle the effects of ageing from disuse and disease when assessing older people's functionality. Much of the so-called 'age-related changes in body composition (e.g. fat, muscle, bone) are associated with decreased physical activity, excess energy intake or both (Fiatarone Singh 2002). Cross sectional studies have reported declines in muscle strength with ageing. Longitudinal data indicates that the declines may be greater than had been estimated from cross sectional data, with older old people demonstrating a greater rate of decline than younger age groups, particularly for leg strength (Hughes, Frontera et al. 2001). In this study, physical activity decline was not directly associated with the strength changes over time. The data indicated that isokinetic strength decreases were not universal, with some gains being seen, even with concurrent muscle mass loss (muscle mass change accounted for only 5% of the change in strength).

9.2 The frail older person

Many frail older people remain in the community with formal and informal care provision, although some are living in the residential aged care setting. Sedentary behaviour in older people increases the risk of the health problems outlined in Chapter 3 and increases the likelihood of someone requiring to be cared for in the residential aged care setting. Physical activity can assist independence amongst frail older people and reduce the burden on their informal carers. The Home Support Exercise Program (Tudor Locke, Myers et al. 2000) was established in Calgary, Canada, to assist those already receiving formal home care. An evaluation of the program, using a before-after quasi-experimental design, highlighted a range of benefits, from improved physical function (timed up and go, sit to stand, 6 minute walk) through to better sleep patterns and sense of wellbeing (Tudor Locke, Myers et al. 2000). Participants ranged from 65 to 98 years in age and had an average involvement of 5.6 days of exercising per week. The estimated cost of providing the program was \$92 (Canadian dollars) per person. This was based upon the cost of training health care workers and a modest uptake of the exercises amongst clients (10%). The costs are low, since health care workers cost less than health professionals and they are routinely seeing these clients as part of overall care provision. There was no need for medical clearance, transport or expensive equipment. The evaluation highlighted some time and program management challenges that need to be addressed, but the program appears feasible. This program is far less costly than that reported by Gill et al. (2002) - \$2000, where health professionals were used and equipment was needed.

Strategies to optimise adherence are important when introducing programs for frail older people. One study incorporating adherence strategies is the WALC program (Walk; Address pain, fear, fatigue during exercise; Learn about exercise; Cue by self-modelling), which encouraged participants to walk on their own or join a walking group, to walk for 20 minutes three times a week (Resnick 2002). Participants were supported by a nurse practitioner who visited them (weekly during month 1, then monthly) to discuss fatigue, pain and fear of falling. The nurse also reviewed their information booklet with them. Long and short-term goals were developed and recorded to act as a reminder and review aid. The intervention was based on social cognitive theory, incorporating mastery of physical activity, seeing like others doing exercise, receiving encouragement and feedback about the physiological and psychological responses to exercise. The intervention had positive outcomes, with increased self-efficacy related to exercise, outcome expectations, exercise behaviour and overall activity in the intervention group. No differences in health status were reported, but the amount of exercise was small, with 3.5-4 hours per month on average. There may be scope for encouraging more exercise to produce health benefits, but this needs to be weighed against increased attrition.

Older people in residential aged care accommodation

A growing number of studies have focused upon physical activity for older people in residential care. Studies involving those living in nursing homes and aged care facilities are included in Cyarto et al's recent update of the literature (Cyarto, Moorhead et al. 2004). The American College of Sports Medicine's 1998 Position Statement on Physical Activity in Older People (Mazzeo, Cavanagh et al. 1998) provided an overview of the evidence for physical activity adoption amongst such frail older people. A range of physical activity programs have been shown to be helpful. A variety of outcomes have been measured including function (McMurdo and Rennie 1993; Mulrow, Gerety et al. 1994; Morris, Fiatarone et al. 1999; Meuleman, Brechue et al. 2000), muscle strength (Sauvage, Myklebust et al. 1992; Lazowski, Ecclestone et al. 1999; Morris, Fiatarone et al. 1999), endurance (Sauvage, Myklebust et al. 1992; Gillies, Aitchison et al. 1999; Lazowski, Ecclestone et al. 1999; Morris, Fiatarone et al. 1999; Meuleman, Brechue et al. 2000), balance (Mulrow, Gerety et al. 1994; Lazowski, Ecclestone et al. 1999; Morris, Fiatarone et al. 1999) flexibility (Lazowski, Ecclestone et al. 1999) and mood (Morris, Fiatarone et al. 1999).

Many of the studies have had small sample sizes. An exception is Morris et al's trial, which involved 468 people (Morris, Fiatarone et al. 1999). Morris and colleagues (1999) compared different types of physical activity program for nursing home residents. In their cluster randomised trial, one group

received a mobility and strengthening program, another functional rehabilitation provided by nursing staff and the third received usual care. At 10 months follow up, there was a significant reduction in functional decline in the two intervention groups compared to the usual care group. In particular, declines in locomotion ability were noted. Sheltered housing residents with lower limb weakness showed improved strength and activities of daily living after 10 weeks of supervised strength training with Therabands™ (Westhoff, Stemmerick et al. 2000). An hourly program once a week in New Zealand women (mean age 83 years) in residential care reduced the time taken to stand up and decreased the need for associated hand assistance (O'Hagan, Smith et al. 1994). McMurdo and Rennie (1993) trialled a seated exercise program with older people in residential aged care accommodation. The 30 minutes, twice a week program preserved function and even restored function in some participants, whilst the control group who had a reminiscence program demonstrated deterioration in function. Physical activity has also been shown to benefit sleep patterns in residential aged care dwellers (Alessi, Martin et al. 2005). The specific impact of physical activity as part of a multifaceted program in isolation is not able to be determined from this study's methodology.

There have even been a few trials targeting residents with Alzheimer's disease, albeit with small sample sizes (Tappen 1994; Tappen, Roach et al. 2000; Cott, Dawson et al. 2002). One 16 week walking and talking intervention found no significant group differences (Cott, Dawson et al. 2002), whereas another reported less deterioration in distance walked when participants were compared to those who only walked or talked (Tappen, Roach et al. 2000). A 20 week program targeting functional skills showed ADL improvements post intervention (Tappen 1994). Attrition was common across studies. In one study less than half completed a mobility, strength and exercise program (Schnelle, Alessi et al. 2002), although improvements in injury risk and upper body strength were seen amongst completers.

Not all trials with residential care participants have reported significant differences between intervention and control groups. Karl (1982) reported no significant effect, but suffered from several methodological weaknesses. Other studies have found only small between group differences (Sauvage, Myklebust et al. 1992; Kinion, Christie et al. 1993; Mulrow, Gerety et al. 1994; Gillies, Aitchison et al. 1999; Meuleman, Brechue et al. 2000). The greatest improvement in function was seen more in those most impaired at baseline in Meuleman et al's study (2000). The authors also noted that few people could effectively perform the endurance training component of the program. This has implications for the targeting and design of interventions. The cost effectiveness of programs also needs consideration. In a four month physical therapy program involving range of motion, balance, transfer and mobility exercises improvements in mobility and a reduced likelihood of using assistive devices for locomotion were reported (Mulrow, Gerety et al. 1994). The average cost of this intervention was \$1220 per subject, compared to \$189 for the social visit control and other healthcare charges of \$11,398. A full cost benefit analysis was not conducted. The costs can be reduced by using para-professional staff, or even care staff or volunteers at the facilities, so long as suitable training is provided (Kinion, Christie et al. 1993; Lazowski, Ecclestone et al. 1999).

9.3 Disability

Physical disability can occur at any age and has a multidimensional aetiology. Amongst older people, physical disability has been reviewed from several perspectives. For example, in their review, Latham and colleagues (2005) concentrated on the decline in muscle strength with ageing as a source of physical disability. Their review thus sought to determine whether progressive resistance training (PRT), as a single exercise intervention, reduces physical disability in older people. Measures of physical disability included measures of daily activities and measures of physical domains of health-related quality of life.

Whilst there is clear evidence that physical activity creates physical health and function improvements for older people, the current evidence base does not provide strong support for physical activity as a means of *reducing* disability across its domains. Nor does it indicate that

physical activity can assist in the restoration of capacity in disabled people: rather it can prevent exacerbation of problems (Latham, Anderson et al. 2003).

A review of the outcomes associated with physical, social, emotional and overall disability was conducted by Keysor and Jette (2001). With the exception of osteoarthritis, they excluded people with pre-existing conditions, which has implications for their findings. With regard to impairment, the majority of studies assessed strength (23/26) and showed that physical activity participants improved strength compared with controls. Similar proportions of positive findings were reported for studies assessing aerobic capacity and flexibility. Functional limitation studies commonly reported walking and standing balance improvements. This in part reflects the common use of these as outcome measures. The findings for other physical, social, emotional and overall disability outcomes were limited in scope (obtained from far fewer studies) and equivocal. For example, only five out of 14 studies assessing physical disability reported improvements, with effect sizes ranging from 0.23 to 0.88. The largest effect size was found by Kovar et al. (1992) in a trial of 40-89 year olds (mean age 69 years) with osteoarthritis. Mueleman et al. (2000) only found a positive effect amongst those with greater disability.

Neurological disorders contribute to disability and participation restriction in older people. They can be categorised as a) event related, such as stroke, and b) progressive, such as Parkinson's disease, multiple sclerosis and post-polio syndrome. Improved survival means that more people are entering old age with these conditions. The implications of neurological disorders for older people's health require consideration, and there is limited but growing evidence concerning the potential benefits of physical activity for people with these conditions. Common symptoms that may be ameliorated by physical activity training are gait and balance impairments, function, and fatigue. In a commentary review of studies including both adults and children (Eldar and Marincek 2000) concluded that there was insufficient evidence to support promotion of physical activity for those with Parkinson's disease and Guillain-Barre syndrome. A review of physical therapy for Parkinson's disease, which primarily included exercise interventions, identified benefits in function and gait (de Goede, Keus et al. 2001).

In stroke patients, aerobic exercise training (Pang, Eng et al. 2006), and task oriented exercise training targeting balance and gait have both been shown to improve functional and mobility related outcomes relative to standard rehabilitation / usual care, particularly in the earlier stages after stroke (van Peppen, Kwakkel et al. 2004). There is some level IV evidence from small studies that indicates that physical activity - walking, swimming and cycle ergometry - is useful for producing functional gains in stroke survivors, at later stages post stroke. The reviewers noted that whilst stroke rehabilitation is effective in promoting functional status, physical deconditioning may not be addressed. A systematic review of PRT following stroke reported some reduction in musculoskeletal impairment, but noted that there was insufficient evidence to date regarding improved performance of functional activities or social participation (Morris, Dodd et al. 2004). Further, gains made during rehabilitation are lost if people have a sedentary lifestyle on discharge. There has been limited trialling of home-based programs for people discharged from hospital, with short term benefits to neurological impairment and lower extremity function (Duncan, Richards et al. 1998). More community and home-based interventions to promote continued physical activity are needed.

Limited level II and IV evidence indicated that people with multiple sclerosis and post-polio syndrome have functional gains, but none of the studies included those over 65 years. The review identified only three studies of physical activity for adults with disabilities: chronic low back pain, chronic obstructive pulmonary disease (COPD) and osteoarthritis. No studies were found for para- or quadriplegia, mental retardation, multiple sclerosis or poliomyelitis. Sutherland and Anderson (2001) reviewed several controlled trials of aerobic exercise in multiple sclerosis and found some improvements in cardiovascular fitness. A small trial of yoga and cycling exercise for adults (mean age 48 years) with multiple sclerosis reported reductions in fatigue after 6 months of weekly classes and home practice (Oken, Kishiyama et al. 2004). No significant changes for cognitive outcomes such as attention, nor for mood state were attained.

Keysor and Jette noted the methodological limitations of existing studies and comment on the theoretical limitations of the biomedical disability model commonly underpinning existing studies (Keysor and Jette 2001). There is a need for contextual, behavioural and social factors to be considered when assessing the uptake of physical activity in older people. Future trials need to address an individual's beliefs and self efficacy and the influences of the person's physical and social environment. Outcome measures need to closely reflect the area of disability and participation restriction (handicap) that the intervention is intended to affect.

To quote Taylor et al:

'In intervention studies, the basic challenges are a theoretical framework, valid and reliable measures, a strong experimental design, an effective intervention and minimum attrition. In all of these areas, physical activity interventions in... populations with disabilities require more rigorous development and study' (Taylor, Baranowski et al. 1998)(pg 341).

9.4 People with comorbidities

9.4.1 Cardiovascular disease

Older people with - or at risk from - CVD can benefit from physical activity adoption. Given the greater risk associated with vigorous activity, lower intensity activity seems preferable for older people in the prevention of heart disease. A meta-analysis found that vigorous activity is generally less effective than lower intensity activity in reducing blood pressure, particularly diastolic blood pressure (Whelton, Chin et al. 2002). Whilst heart disease may still occur in the physically active, it tends to present at a later age and be less severe (Haskell, Leon et al. 1992). The Iowa study reported that active women had better cardiovascular risk profiles than the sedentary i.e. lower blood pressure (BP), body mass index (BMI) and low density lipoprotein (LDL)-cholesterol (Kushi, Fee et al. 1997).

Several commentary reviews suggest that physical activity may be effective in the secondary prevention of heart disease and stroke (Kohl 2001). Various types of physical activity can aid the management of CVD. Crucially, there have been no significant complications or adverse outcomes reported. Older people with clinically stable heart failure can safely participate in low to moderate aerobic exercise (Witham, Struthers et al. 2003; Briffa, Maiorana et al. 2006). Progressive resistance training (PRT) has also produced health gains amongst those with chronic heart failure (CHF) (Witham, Struthers et al. 2003). The generalisability of exercise training findings for CHF remains limited. Witham and colleagues note that the evidence comes from research studies where the samples were highly selected in terms of age and overall health status (Witham, Struthers et al. 2003). Before this specialised rehabilitation training can be routinely used in the clinical setting, there is a need for further studies to test the transference of the findings to more disabled older people. Maintenance of physical activity is also important: the studies have tended to report on post-training effects, with follow-up studies showing a reversal of benefits once training ceases (Witham, Struthers et al. 2003).

In addition to the physiological improvements reported, clinically relevant benefits to symptomology, such as fatigue and dyspnoea, have been noted, plus improved quality of life. Older men with coronary heart disease have achieved improved mental health and functional capacity from regular exercise programs (Briffa, Maiorana et al. 2006).

The National Heart Foundation of Australia recommendation for older people with CVD is for low to moderate intensity physical activity, with multiple shorter episodes daily. As they progress, the duration of episodes can increase. A similar recommendation was made for those with peripheral vascular disease (PVD) and stroke survivors. Further details concerning physical activity and CVD can be obtained from this useful evidence based resource (Briffa, Maiorana et al. 2006)

9.4.2 Diabetes

Many of the diabetes prevention programs have been multifaceted, making it difficult to discern the unique impact of physical activity. A meta-analysis of exercise interventions, including exercise alone and exercise plus dietary modifications, reported a clinically significant improvement in HbA1c levels, of a similar level to drug treatments (Boule, Haddad et al. 2001). Crucially, the improvement was not mediated by exercise volume or intensity, nor was weight loss needed to produce the positive outcome. Both aerobic and resistance exercise were effective. The authors note that exercise therapy may offer additional benefits to cardiovascular risk reduction beyond those afforded by drugs alone. The review included people from a variety of ethnic backgrounds, increasing the generalisability of the findings. However, the meta-analysis contained only one study where the sample were solely older people. This study did not find a significant difference in HbA1c between intervention group and controls (Tessier, Menard et al. 2000). There was a significant decrease in glucose excursion during the glucose tolerance test, improved attitudes towards diabetes and more capacity for sustained exercise in the intervention group compared to controls. The impact on insulin resistance seemed more marked amongst females, the obese and those with higher HbA1c levels.

Exercise has a role as an adjuvant drug treatment for people with type 2 diabetes, although a clinical review of diabetes in older people commented on the equivocal evidence for exercise in the management of diabetes in older people (Meneilly and Tessier 2001). Several subsequent trials of type 2 diabetes management have included older adults (Castaneda, Layne et al. 2002; Di Loreto, Fanelli et al. 2003; Brown, Ford et al. 2005; Dunstan, Daly et al. 2005). A recent trial that focused on older people used high intensity PRT and a moderate weight loss program and compared this with the moderate weight loss program alone (Daly, Dunstan et al. 2005). There was 6 months gym based then 6 month home based exercise. Weight and fat mass (FM) decreased at 6 months in both groups, but at 12 months follow up, weight and FM had significantly increased again (from the 6 month levels) in both groups. Crucially, although strength increases were maintained, improvements in glycaemic control and insulin were not maintained by the home-based program. This emphasizes the need for continued adherence to physical activity at sufficient volume and intensity to sustain the benefits seen with a closely supervised program.

Chapter 5 referred to the importance of motivating people in order to maintain physical activity behaviour. Pedometers have been used for some time as outcome measurement instruments, but are currently popular as motivating tools, although the evidence base for their use in this regard is limited. A coaching trial for sedentary overweight older people with type 2 diabetes examined the impact of pedometers on walking and physiological outcomes (Engel and Lindner 2006). Contrary to expectations, time spent walking was greater in the coaching only group. There were improvements in weight, waist circumference and cardiovascular fitness for both groups.

9.4.3 Obesity

It is accepted that physical inactivity and obesity are both important mortality risk factors. The few studies that have looked at stratified levels of physical activity within BMI categories tend to support the fact that inactivity is a risk factor across all categories. Preventive measures are particularly scarce: the focus is usually on weight reduction in conjunction with the management of a chronic condition. In reviewing whether physical activity prevents weight gain in Caucasian adults, Fogelholm and Kukkonen-Harjula (2000) noted that the overall evidence for physical activity was modest - not least because of limitations noted elsewhere in this document - that the volume of physical activity used often being insufficient and adherence being less than optimal. Many of the interventions for obesity include exercise as part of a multifaceted program. The evidence generally suggests that diet and physical activity are more effective in combination than physical activity alone. To sustain weight loss, maintenance strategies such as professional mentoring or self help groups can play a role. Older people have been included in studies, but there is limited evidence for this sub-group alone.

9.4.4 Cancer

Chapter 4 referred to the evidence for the role of physical activity in the prevention of certain types of cancer. The search conducted to produce this document did not identify any intervention studies in the cancer field.

9.4.5 Mental health

Qualitative evidence indicates that physical activity contributes to mental health through “maintenance of a busy and active life, mental alertness, positive attitude toward life, and avoidance of stress, negative function, and isolation” (Stathi, Fox et al. 2002) pg 76, but the actual mechanisms have not yet been established. There is no consistent association between mood and physical activity, possibly because of the transient nature of many mood states (Emery and Blumenthal 1991). For clinical conditions, there is increasing evidence for the benefits of physical activity in their management.

Depression

Depression often co-exists with other health problems and can be a side effect of certain medications, such as some of those used in the management of arthritis (Leon, Ashton et al. 2003). Whilst antidepressants may be effective, they can have significant side effects, such as increased risk of hip fracture (Fiatarone Singh 2002). Depression is debilitating to the individual and incurs both social and economic costs. There are many trials where people with a variety of conditions (e.g. coronary heart disease, chronic obstructive pulmonary disease, cancer, arthritis, multiple sclerosis, chronic fatigue syndrome), have demonstrated reduced levels of depressive symptoms following a physical activity program. Interpretation of these findings has to be sensitive not only to methodological constraints, but also to the fact that not all participants were clinically depressed at the time of the physical activity intervention (Paluska and Schwenk 2000). To posit a clearer association, studies using clinically depressed people are required.

Level 1 evidence suggests that physical activity is preferable to no treatment or social contact alone and that it has a similar effect to standard antidepressant drug or psychological treatments for both adults (North, McCullagh et al. 1990; Craft and Landers 1998; Lawlor and Hopker 2001; Brosse, Sheets et al. 2002) and older adults (Frazer, Christensen et al. 2005; Palmer 2005). Recent meta-analytic and experimental studies show a significant antidepressant effect for physical activity in older adults with clinical depression, supporting the use of physical activity in the management of depression in older people (Taylor, Cable et al. 2004; Frazer, Christensen et al. 2005). Reviewers have been critical of the quality of studies (Lawlor and Hopker 2001) particularly where physical activity failed to improve on the effectiveness of medications (Blumenthal 1999). Common methodological weaknesses include a lack of a standard diagnostic process for identifying depression in participants and a short follow up period (Dunn, Trivedi et al. 2001; Lawlor and Hopker 2001).

Aerobic and resistance training have both produced benefits. Both moderate and vigorous levels of exercise shows efficacy in reducing depressive symptoms (Dunn, Trivedi et al. 2001). Singh et al. (2001; 2005) have reported positive effects following progressive resistance training (PRT) in older people with depression. Their most recent research highlights the importance of exercise intensity, with the high intensity group being significantly more likely to reduce their depressive status (61% versus 29% in the low intensity group and 21% in the usual care group) (Singh, Stavrinou et al. 2005). The reduction was associated with actual strength gain, suggestive of an underlying biological mechanism. There were indications that vitality and sleep quality were particularly improved in the high intensity PRT group. Research is ongoing to elucidate the role of social contact in exercise programs for older people with depression. In Singh et al's study socialization did not seem to explain the impact of PRT: only the high intensity group achieved clinically significant benefits (Singh, Stavrinou et al. 2005). Belief in the perceived gains from the program seemed to produce a

placebo effect for the low intensity group, whereas efficacy belief did not predict outcome in the high intensity group.

Physical activity may reduce the risk of depression relapse, but the evidence is scarce (Babyak, Blumenthal et al. 2000). In a trial with major depressives, aerobic exercise was found to be of similar benefit to the antidepressant sertraline (Blumenthal 1999). Given the poor adherence to antidepressant medication, it is interesting to note that at six months follow-up, relapse rates were lower in the exercise group (Babyak, Blumenthal et al. 2000). One study focused on people who had not responded to antidepressant treatment (Mather, Rodriguez et al. 2002). Aerobic exercise was of short-term benefit as an adjunct treatment. Secondary analyses in an osteoarthritis trial found improvements in depressive symptoms and disability at 18 months post aerobic, but not resistance, training (Penninx, Rejeski et al. 2002).

Other affective disorders

There is limited evidence for physical activity in the management of other psychological conditions. For example, a small pilot with a before after design indicated some gains for adults with post traumatic stress disorder (Manger and Motta 2005) in terms of reductions in anxiety, depression and post traumatic stress disorder (PTSD symptoms). Although the evidence base is small, gains similar to those from meditation and relaxation have been found for anxiety and panic disorder, with acute anxiety responding better to physical activity therapy. Several trials have shown that progressive resistance training delivered over 10 weeks improves mood in the short term and, in one trial, to 12 months (Singh, Clements et al. 2001; Mather, Rodriguez et al. 2002; Penninx, Rejeski et al. 2002). Other trials successfully tested aerobic activity (Blumenthal 1999; Babyak, Blumenthal et al. 2000; Singh, Clements et al. 2001) and less intensive activity such as walking (McNeil, LeBlanc et al. 1991).

Cognitive health

Various aspects of cognition have been improved by physical activity but the evidence base is limited by small studies and weak designs (Hogan 2005). In nursing home residents with cognitive impairment and incontinence, the Functional Incidental Training program (incorporating additional walking / transfers together with a prompted toileting regime) achieved significant improvements in mobility, as well as reduced agitation (the prompted toileting program in isolation also reduced agitation) (Schnelle, Macrae et al. 1995). In contrast, a structured exercise program (walking or wheelchair mobility training, together with work on a rowing machine) in a cognitively impaired, physically restrained sample of nursing home residents had a high dropout rate (54% over 9 weeks), but did achieve significant improvements in injury risk and upper body strength and endurance (Schnelle, MacRae et al. 1996). There were no significant changes in lower body strength. This study highlights that despite the range of difficulties encountered in implementing physical activity programs for older people with marked cognitive impairment, that positive outcomes can be achieved in those who are able to participate.

There is some evidence that physical activity can help in the management of people with dementia, by improving disruptive behaviour, functional health, sleep patterns and alertness. For people who require medication or physical restraint, physical activity affords a potentially safer and cheaper alternative treatment approach. In a quasi- experimental study, Holliman et al. (2001) piloted a 30 minute interactive group activity for people (n =14) with moderate to severe dementia, designed to enhance purposeful upper limb activity and social interaction. The intervention produced acute behavioural benefits, but these were not sustained beyond the sessions themselves. Given the low cost of running such sessions (staff or volunteers could be trained to run them), it may be worth trialling such an intervention with a larger sample over a longer period than this two-week pilot, to assess the ongoing impact.

9.4.6 Injury prevention

Physical activity has been shown to be effective in reducing falls either as a single intervention or as part of a multifaceted intervention (Hill, Vrantidis et al. 2004; Sherrington, Lord et al. 2004). Examples of successful community-based programs include:

- Targeted home exercise programs incorporating balance and strengthening exercises, developed by a physiotherapist or another trained health professional following an assessment (Robertson, Campbell et al. 2002);
- Group exercise programs incorporating a combination of balance, strength, mobility and fitness exercises (Rubenstein, Josephson et al. 2000; Day, Fildes et al. 2002; Barnett, Smith et al. 2003);
- Group exercise programs using an abbreviated set of forms from the 24 form Tai Chi Quan (Wolf, Barnhart et al. 1996).

In contrast to the community setting, there is relatively little level I or II evidence regarding effective falls and falls related injury prevention programs in residential care settings. Randomised controlled trials have reported significant reduction in falls rates in residential care settings using a group exercise program (retirement village setting) (Lord, Castell et al. 2003). In addition, a program incorporating frequent toileting and increased incidental activity (such as walking / transferring), called the Functional Incidental Training (FIT) program, was shown to reduce falls (Schnelle, Kapur et al. 2003). Multifaceted interventions which have incorporated exercise approaches together with a range of other falls prevention activities (such as assessment, staff training, environmental modification, and hip protectors) have also been shown to reduce falls (Jensen, Lundin-Olsson et al. 2002; Becker, Kron et al. 2003).

9.4.7 Musculoskeletal health

Arthritis and musculoskeletal conditions are the chief causes of disability in Australia: around 1.2 million Australians (about 32% of all persons with a disability) have a disability due to these conditions. There are associated activity restrictions, notably in mobility and self-care. Arthritis and musculoskeletal conditions were estimated to account for 4% of the disease burden in Australia in 1996, in terms of disability-adjusted life years (DALYs). The direct costs of arthritis and musculoskeletal conditions were estimated at \$4.7 billion in 2000-1 (Australian Institute of Health and Welfare 2005).

In Keysor and Jette's review of disability (2001), three of the five studies that found positive effects on both function and disability involved people with arthritis (Minor, Hewett et al. 1989; Kovar, Allegrandte et al. 1992; Ettinger, Burn et al. 1997). Notably, people with musculoskeletal conditions may find it difficult to do land-based aerobic physical activities because of the impact on joints. There is evidence that water-based exercises can be helpful for those with osteo- and rheumatoid arthritis. There have been four randomised controlled trials of water exercises/hydrotherapy for older people with musculoskeletal problems, with positive outcomes in terms of functional reach (Simmons and Hansen 1996), muscle endurance, work capacity (Ruoti, Troup et al. 1994), muscle strength, cardiorespiratory fitness, body fat and total cholesterol (Takeshima, Rogers et al. 2002), and muscle strength, distance walked and self rated health (Foley, Halbert et al. 2003). An Australian implementation trial, using local aquatic facilities with an existing program reported improved balance and shoulder range of motion compared to a control group (Lord, Tiedemann et al. 2005).

An increasingly popular type of Tai Chi in Australia and internationally is 'Tai Chi for Arthritis', which is a gentle combination of forms for people with more limited mobility. Tai Chi for Arthritis has been shown to improve balance, leg strength, and function in older people with arthritis (Song, Lee et al. 2003; Verhagen, Immink et al. 2004). Two RCTs have reported the effectiveness of Tai Chi in the management of people with osteoarthritis. One reported improvements in arthritic symptoms, balance and self perceived function (Song, Lee et al. 2003). The other found significant

improvements in self efficacy for arthritis symptoms, satisfaction with general health and trends for improved mobility and standing up from a chair (Hartman, Manos et al. 2000).

A UK group recently produced the MOVE consensus report, evidence based recommendations regarding exercise in the management of osteoarthritis of the hip or knee (Roddy, Zhang et al. 2005). The recommendations are shown in Figure 9.1 below.

Figure 9.1 Recommendations for physical activity in the management of osteoarthritis of the hip or knee.

Both strengthening and aerobic exercise can reduce pain and improve function and health status in those with knee OA (1B evidence) but there is only level 4 evidence for hip OA
There are few contraindications to the prescription of strengthening and aerobic exercise in those with knee or hip OA: the number of contraindications is small (level 4 evidence)
Prescription of both general aerobic and local strengthening exercises is an essential, core aspect of management for every patient with knee or hip OA (level 4 evidence)
Exercise therapy for knee or hip OA should be individualized and patient-centred, taking into account factors such as age and overall comorbidity (level 4 evidence)
To be effective, exercise programs should include advice and education to promote a positive lifestyle change with an increase in physical activity: Level 1B evidence for strategy effectiveness, but only level 4 evidence that such techniques are needed for exercise programs to be effective
Group exercise and home exercise are equally effective and patient preference should be considered (level 1A evidence for both)
Adherence is the principal predictor of long-term outcome from exercise in those with knee or hip OA: level 1 evidence supports adherence, but only level 4 evidence supports it as the principal predictor
Strategies to improve and maintain adherence should be adopted e.g. long-term monitoring/review and inclusion of spouse/family in exercise: 1 B evidence extrapolated from general literature. Only level 4 for specifically for knee or hip OA
The effectiveness of exercise is independent of the presence or severity of radiographic findings: the current evidence does NOT support this recommendation.
Improvements in muscle strength and proprioception gained from exercise programs may reduce the progression of knee and hip OA: this is based solely on level 4 evidence.
Key Level 1A metaanalysis of RCT Level 1B at least 1 RCT Level 4 Expert committee reports/opinions and /or clinical opinion of respected authorities

Source: Roddy 2005

9.4.8 Respiratory disease

A systematic review of the benefits of exercise ('physical training') for asthmatics included 13 studies, all with children as participants (Ram, Robinson et al. 2005). The findings indicated that maximum oxygen consumption and expiratory ventilation could be increased without any adverse impact on pulmonary function or wheezing. Whether these findings are generalisable to older people is not known. As noted in Chapter 4, much of the respiratory disease literature focuses on asthma. Use of physical activity in the management of respiratory conditions has not been extensively researched. Acute episodes of asthma or unstable chronic obstructive pulmonary disease (COPD) are contraindications for physical activity. However, where the condition is stable, the use of physical activity as part of the management can confer benefits additional to those obtained from pharmacological intervention alone (Mazzeo, Cavanagh et al. 1998).

The benefits of physical activity for COPD patients is recognised and rehabilitation programs include both aerobic and resistance exercises. The challenge is to maintain the gains beyond the rehabilitation program. Spruit and colleagues (2004) note that the benefits wane with time and call for strategies to maintain physical activity behaviour beyond the intensive, supervised rehabilitation programs. In a trial of physical activity maintenance for older people with COPD, Wadell and colleagues found that whilst weekly training was insufficient to maintain improvements observed following an initial high frequency training program (Wadell, Henriksson-Larsen et al. 2005), such low frequency training can prevent deterioration in physical capacity and health related quality of life. The importance of monitoring was demonstrated by Katsura et al. (2004), who found that exercise capacity, dyspnoea and quality of life gains were maintained up until one year follow up in a group who had monthly outpatient visits. They noted that the gains were sustained for both the younger old people and those aged over 75 years. Interestingly, the gains were greater in the old old group, who were more debilitated at baseline. The findings may not be wholly generalisable, since these were people chosen on the basis of being well motivated at baseline, as indicated by their average adherence of 82% to a post-rehabilitation home exercise program. A review of five earlier studies failed to find consistent improvements in dyspnoea and quality of life (Chavannes, Vollenberg et al. 2002).

There is no consensus on the optimal dose for COPD rehabilitation. The review evidence suggests that a high intensity program is preferable for the initial rehabilitation. Thereafter, adherence may be more important. It is better to do some activity consistently than to try to continue to maintain high intensity activity, fail and stop altogether.

As noted in Chapter 5, self-efficacy influences compliance to physical activity programs. Self efficacy has been shown to be strongly associated with physiological status (e.g., pulmonary function, exercise tolerance, diffusing capacity) in COPD patients (Kaplan, Atkins et al. 1984; Toshima, Kaplan et al. 1990). Self efficacy can both predict the uptake of physical activity and be sustained by engagement in physical activity, producing comprehensive health benefits. Kaplan and colleagues found self efficacy to be a significant predictor of survival in people with COPD (Kaplan, Atkins et al. 1984): this trait may be enhanced by physical activity uptake.

9.5 Aboriginal and Torres Strait Islanders

As noted in Chapter 4, life expectancy is lower in Aboriginal and Torres Strait Islander communities and the burden of disease from chronic conditions is greater than in the wider community (Australian Bureau of Statistics 2001). For example, Type 2 diabetes and coronary heart disease are the major causes of death and are more prevalent at a younger age in Aboriginal and Torres Strait Islander adults (Australian Bureau of Statistics 2003). A review in the Getting Australia Active update (Bull, Bauman et al. 2004) found few published studies focusing on this community and none specifically focusing on older people. As in other population sectors, physical inactivity and obesity are key risk factors for a range of comorbidities. Mental health problems need particular attention: they not only influence quality of life, but act as risk factors for coronary heart disease. There is thus great scope to focus on physical activity promotion in this community, to address complex health

problems. Physical activity has the potential to promote both individual and community health by contributing to capacity building and reducing social isolation.

The Royal Australian College of General Practitioners report 'Evidence base to a preventive health assessment in Aboriginal and Torres Strait Islander peoples' contains a series of recommendations regarding physical activity behaviour (National Aboriginal Community Controlled Health Organisation 2005). No specific focus upon older Indigenous people was provided. The recommendations largely reflected the mainstream literature: very little research has been conducted on interventions specific to the Indigenous Australian population. The evidence has largely been derived from studies of Caucasian older people, which poses limitations upon its generalisability.

CLDB groups

A review conducted in the late 1990's specifically focused on identifying physical activity interventions for those of CLDB located only ten studies and thus stated that it was premature to discuss the public health implications of the research (Taylor, Baranowski et al. 1998). Hillsdon et al's more recent systematic review did not include any studies that specifically examined the effectiveness of physical activity interventions in older people from different minority groups (Hillsdon, Foster et al. 2005).

Authors have recommended systematic use of theoretically based approaches when promoting physical activity in CLDB communities (Taylor, Baranowski et al. 1998; Conn, Minor et al. 2003). Targeting physical activity promotion has been shown to be particularly effective with CLDB women. There has been less research involving CLDB males. Qualitative data from NSW's long-standing AIM program - a series of classes at a variety of community venues- confirms the importance of social and structural factors in supporting physical activity in CLDB and frail older people (Stickney and Vilshanskaya 2005). Socialisation often triggered attendance in the former group. People maintained attendance due to the health benefits gained. The frail older people were more likely to begin exercising to aid health programs whilst they continued to attend because of the social benefits. Participants valued the respect afforded them by the facilitators. Providers aimed to enable service flexibility, linking with community partners to address access issues such as cost and transport. The heterogeneity of the CLDB groups was recognised: both mixed and language-specific groups operated.

US researchers have explored strategies for attracting different CLDB groups to physical activity programs. King et al. compared a random-digit dial telephone campaign to a community media campaign and found no ethnic differences in response to these two modes (King, Harris et al. 1994). Another US study involving African American, Latina and Asian women found a preference amongst all three groups for passive approaches, i.e. where the person sees a message and responds to it, rather than an active approach, i.e. where the researcher (or provider) contacts the person directly (Lee, McGinnis et al. 1998). Wilbur and colleagues (2001) reported a higher recruitment efficiency in Caucasian compared to African American middle-aged women (45-65 years old). Recruitment by email was more successful than flyers, newsprint and television coverage for both groups. Their results are limited in their generalisability as the women were all employed and chiefly professionals.

There is a scarcity of culturally specific tools for determining outcomes from potentially useful program models. As Taylor and colleagues state, any new study with CLDB groups should ensure that the outcome measures are reliable and valid for use in that group (Taylor, Baranowski et al. 1998).

The existing research does not allow discernment of whether programs need to be tailored to each specific CLDB group separately, or whether more generic principles and processes can be used across a number of CLDB groups. Whilst not specific to older people, a number of

recommendations have been proposed when mounting health promotion programs for CLDB groups (Figure 9.2).

Figure 9.2 Recommendations for conducting culturally appropriate physical activity programs

Avoid the potential superficiality of targeting an intervention to a community characterized by racial or ethnic designation.
Identify attributes related to health behaviour, not just ethnic background
Define groups by attitudes, beliefs, cultural concepts and cultural dimensions to health practices
Tailor by culture as necessary but reach across cultures when appropriate

Source: Pasick 1996

SUMMARY

Physical activity can assist in the management of a range of health problems, level of frailty and setting, offering a low cost, non-pharmacological option as an independent therapy or adjuvant to traditional drug therapies. More evidence is needed about the sustained effects of programs. A comprehensive economic analysis is needed of interventions in order to make a proper cost benefit analysis to guide future planning. There is ample level II evidence for strength and flexibility training for frail older people in their own homes and in residential aged care accommodation and developing evidence for balance/mobility and cardiovascular training programs in this group. However, we need more information about which frail older people may be best to target. There is very limited evidence to enable generalisation of trial findings to the various cultural groups living in Australia. Evidence concerning Indigenous Australians and the impact of physical activities is particularly scarce.

10 Draft Recommendations

Intended Purpose and development of the Recommendations

The recommendations are aimed to provide a basis for improving physical activity participation for older Australians. They are based upon the review of the research evidence reported in the previous Chapters, the review of recommendations documented in existing guidelines and consensus position statements from international expert professional groups, as well as being considered in the context of existing National Physical Activity Guidelines for adults (Department of Health and Aged Care 1999). Emphasis was placed on ensuring consistency between the existing guidelines for all adults, and those developed for older adults. The existing guidelines for physical activity for adults are:

- Think of movement as an opportunity, not an inconvenience
- Be active everyday in as many ways as you can
- Put together at least 30 minutes of moderately intensive physical activity on most, if not all, days
- If you can, also enjoy some regular vigorous physical activity for extra health and fitness.

The Recommendations have two key audiences. The first are the consumers, that is, older Australians themselves. The second group are the policy makers and service providers. This latter stakeholder group contains not only those working within the health and leisure sectors, but all those who influence the contextual factors that are associated with physical activity behaviour. This includes those working in the media, transport, building and education sectors.

The draft recommendations on physical activity for health for older Australians are:

Recommendation 1

Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.

Recommendation 2

Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.

Recommendation 3

Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.

Recommendation 4

Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up the amount, type and frequency of activity.

Recommendation 5

Older people who have enjoyed a lifetime of vigorous physical activity should continue to participate at this level in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.

Each recommendation has support information to provide additional context for the recommendation. The support information for each recommendation is shown overpage.

Table 10.1. Draft recommendations on physical activity for health for older Australians.

These recommendations were developed in reference to the existing National Physical Activity Guidelines for Adults published by the Australian Government Department of Health and Ageing, namely:

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

The present recommendations are designed to build upon the existing guidelines, by providing advice developed specifically for older Australians. Although the recommendations may be manifested in different ways, according to specific populations or settings, these recommendations apply to older people across all levels of health and ability, and have application for older people living at home or in residential care.

Information supporting the recommendations is available in the *National Physical Activity for Older Australians Discussion Document*, with appropriate sections of the Discussion Document cross referenced to each recommendation.

Definitions

Older people: For the purposes of this document the term “older people” primarily refers to those aged over 65 years, and over 55 years for Aboriginal and Torres Strait Islanders. It is recognised that there are difficulties in ascribing a particular chronological age to define “older people”, and that there is wide variability in health status, function and wellbeing at any age. These recommendations may also have applicability for other age groups, for example, younger people with disabilities.

Physical activity: ‘Any bodily movement produced by skeletal muscles that requires energy expenditure and produces progressive health benefits’ (National Institute of Health Consensus Conference Statement, 1996). Physical activity includes everyday activities like walking to the shop or gardening through to a wide range of organised activities, such as exercise classes.

Moderate level physical activities: Physical activity at a level that causes your heart to beat faster and some shortness of breath, but that you can still talk comfortably while doing (Glasgow et al, 2005).

Vigorous physical activities: Physical activity at a level that causes your heart to beat a lot faster and shortness of breath that makes talking difficult between deep breaths (Glasgow et al, 2005).

General advice when performing physical activities

- Consider physical activities as opportunities for fun with a partner, friends or family members.
- Eating healthy nutritious food in conjunction with being physically active will help to obtain the best health outcomes.
- Drink water during and after physical activity to avoid dehydration.
- A short period of warm up exercises/muscle stretching at the start and at the end of physical activity will help the body adjust to starting or finishing activities that place a physical demand on the body.
- Include some outdoors physical activity, although where possible keep this to a minimum in the hottest part of the day.
- Use appropriate safety and protection equipment to maximise safety and minimise risk of injury during physical activity, for example, use supportive footwear for walking, and a helmet for bicycle riding.

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p><u><i>Recommendation 1</i></u> <i>Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.</i></p> <p>Many improved health and well-being outcomes have been shown to occur with regular physical activity. These include helping to:</p> <ul style="list-style-type: none"> • maintain or improve physical function and independent living; • improve social interactions, quality of life, and reduce depression; • build and maintain healthy bones, muscles and joints, reducing the risk of injuries from falls; and • reduce the risk of heart disease, stroke, high blood pressure, type II diabetes, and some cancers. <p>It's never too late to start becoming physically active, and to feel the associated benefits. "Too old" or "too frail" are not of themselves reasons for an older person not to undertake physical activity. In fact, older people become sick or disabled more often from not undertaking physical activity, than from participating in a physical activity. Most physical activities can be adjusted to accommodate older people with a range of abilities and health problems, including those living in residential care facilities. Physical activity can also improve health outcomes for older people with chronic health conditions such as stroke or arthritis, although activity may need to be modified in periods of an acute flare up of the condition.</p> <p>Physical activity is also valuable for well older people, where maintenance of good health, independence, and disease prevention can be achieved.</p> <p>Many forms of physical activity can be performed with a partner, friends, or in a group, which often increases the enjoyment and takes the mind off the physical nature of the activity.</p>	I	Chapter 4 Chapter 9

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p><i><u>Recommendation 2</u></i> <i>Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.</i></p> <p>There are many different ways that people can be physically active, including:</p> <ul style="list-style-type: none"> • incidental activity, which includes all the moderate intensity routine activities which can be performed as part of everyday life, for example housework, walking to the local shop instead of driving, gardening and raking leaves, and vacuuming; • leisure pursuits that involve physical activity, including golf, lawn bowls, bocce, woodwork, and various types of dancing (for example, ballroom dancing, line dancing); • structured activities such as walking groups, strength training, tai chi or other group exercise activities, hydrotherapy classes (exercise in water) and yoga. Depending on preference and availability of classes, these activities can be done in a group or alone. • supervised physical activity (for example, supervised by a physiotherapist or exercise physiologist), which may be of benefit for older people with moderate health problems, at least when starting out. Examples of older people who may benefit from supervision at least when commencing physical activities are those with heart problems, including following heart surgery; people with neurological problems such as stroke and Parkinson's disease; people with moderately severe arthritis; and those with a high risk of falls. <p>There are three main categories of physical activity types that can achieve improved health, independence and well-being for older people:</p> <ul style="list-style-type: none"> • endurance / fitness activities, where a major emphasis is on increasing the demand on the heart and lungs. Examples include brisk walking, bicycle riding, swimming and jogging; • strength training activities, where the emphasis is on building muscle strength. Examples include resistance exercise, lifting weights, and stair climbing, and; • balance, mobility and flexibility (stretching) activities, where the emphasis is on balance, walking, turning, going up and down steps, muscle flexibility and other mobility related functions. <p>Sometimes physical activities incorporate just one of these types of activities, while others</p>	<p>II</p>	<p>Chapter 8</p>

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p>(such as exercise classes and Tai Chi) may incorporate elements of two or all three of these categories. The range of health benefits achieved is likely to be greater with a mixed range of physical activity options within or between days. In addition, having a number of options or choice in the types of physical activity available can increase motivation and increase the likelihood of uptake and longer term participation in physical activity. Try to include some indoor and outdoor physical activities. Your choice of activities will be influenced by what benefits you want to achieve, what you enjoy doing, and what options are available for you.</p> <p>There are some health benefits that are most commonly achieved by performing one particular category of physical activity. For example, to improve balance and reduce risk of falling, an activity needs to incorporate some balance related movements, while the effect of endurance training on reducing falls does not appear to be as strong. Therefore there may be a preference for a particular category of physical activity to achieve a particular health benefit. However, if the aim is to improve general health, a mix of physical activity from the three categories is recommended.</p>		

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p><i>Recommendation 3</i> <i>Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.</i></p> <p>At least 30 minutes of moderate intensity physical activity on most days has been recommended as the minimum amount to achieve health and well-being benefits, although physical activity does not have to be all in the one episode to achieve these benefits. There is a cumulative effect from activity undertaken in smaller instalments. Therefore, an older person with health problems may be restricted to only doing 10 minutes of physical activity before starting to become short of breath or starting to develop muscle or joint soreness, but can still achieve health benefits by doing 10 minute periods of physical activity at least three times throughout the day.</p> <p>The minimum of 30 minutes of moderate physical activity on most days does not have to be restricted to the one type of physical activity within the one session.</p> <p>Older people who have not been physically active for some time may need to start with less than 30 minutes each day, and gradually build up to 30 minutes or more.</p>	I	<p>Chapter 3 Chapter 5.2 Chapter 8</p>

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p><i>Recommendation 4</i> <i>Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up the amount, type and frequency of activity.</i></p> <p>While the benefits of participating in physical activity can build up fairly quickly, similarly the benefits can be lost quickly if physical activity is stopped for more than 2-3 weeks. Therefore, if an established physical activity routine is stopped for several weeks, then recommenced, the level of intensity should gradually be built back up to the previous level over several weeks to months, depending on how long the break was for, and the reason for the break (for example, if the break was due to a health problem, then building back up the physical activity routine should be more gradual). A similar approach of gradual build up should be used if starting a new type of physical activity.</p> <p>People who have stopped physical activity because of a new health problem may need to discuss resuming physical activity with their doctor, or to resume physical activity in a supervised manner at first (for example, by a physiotherapist or exercise physiologist). People who have recently had surgery, including angioplasty should take into consideration the implications of the surgery with their doctor or health professional when commencing physical activity.</p> <p>If dizziness, palpitations or chest pain occurs during physical activity, the activity should be ceased and advice sought from a doctor. No component of a physical activity routine should cause severe or uncomfortable pain. If such pain is experienced, the activity should be ceased, and discussed with a doctor or health professional such as a physiotherapist.</p> <p>12th May, 2006 – National Ageing Research Institute (NARI) - FINAL</p>	IV	Chapter 4.11

Table 10.1. Draft recommendations on physical activity for health for older Australians.

Recommendation	Level of evidence	Relevant support information section of the discussion document
<p><u>Recommendation 5</u> <i>Older people who have enjoyed a lifetime of vigorous physical activity should continue to participate at this level in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.</i></p> <p>Generally, higher levels of physical activity are associated with greater health outcomes. People who have undertaken vigorous physical activity throughout their lives can often continue safely with vigorous physical activity in later years.</p> <p>However, when commencing a new form of vigorous physical activity, it is important that the level of physical activity is suitable for any health problems an older person has. Before commencing a vigorous form of physical activity, the benefits and risks should be discussed with a doctor or health professional.</p> <p>Gradual progression in the amount and intensity of physical activity is important for older people to gain the best health benefits. This applies for well older people, as well as those with multiple health problems. Some older people who have commenced physical activity in later years can gradually progress to the level of vigorous physical activity.</p>	IV	Chapter 4 Chapter 8

11 Where to next

This final Chapter provides an overview of issues that need to be considered in order to contextualise the findings from the evidence base and to optimise the implementation of the recommendations by older people and key stakeholders alike.

The 'Be Active Australia: A Health Sector Framework for Action 2005-2010' (National Public Health Partnership 2003) document noted that a focus on 'strategic management and coordination', 'community education', 'a coordinated health sector approach to testing community interventions' and 'research, monitoring and evaluation' would facilitate the translation of physical activity evidence into daily practice. In the United States, National Blueprint partner organizations analysed the barriers in the initial Blueprint and identified a range of feasible, short-term priority strategies that could be implemented in the areas of home and community, marketing, medical systems, research, and public policy (National Blueprint: Increasing Physical Activity Among Adults Age 50 and Older). These strategies, which are currently being implemented and evaluated in a range of American communities, are listed in Appendix 8. Whilst a number of these strategies have been employed in Australia, they have not been systematically planned, implemented or evaluated at a national level. In this Chapter we highlight some of the key strategies that will enable the older Australians physical activity recommendations to be comprehensively implemented. The aim is to enable an optimal context for the adoption and maintenance of physical activity in older people.

Cross-sectoral strategies

Many agencies, organisations and all levels of government have a key role in supporting older people to become more physically active. Cross-sectoral coordination and collaboration will be needed at local, regional, state and national level.

Policy and planning

Public policy and advocacy strategies are needed at local, state, and national levels. The development of a cohesive regulatory agenda and the development of a consensus statement on the benefits of physically active lifestyles is recommended. Physical activity is a key feature of many of the National Health priority areas. However, whilst we have national physical activity recommendations, we do not have targets set. That is, unlike immunisation, there is no target for proportions to become physically active by a set time. Nor are there nationwide health service targets for physical activity assessment nor the development of training programs for providers. There is scope to encompass such target setting into the evaluation of the recently introduced MBS item for physical activity assistance and the Lifestyle Prescription program.

Governments at all levels should work with relevant agencies to influence organizational, structural and environmental changes to support active transport and incidental physical activity. One policy initiative that could be advanced is the promotion of active transport. In order to promote alternatives to driving, strategies to improve public transport, walking and cycling tracks are needed. Another challenge is to consider the provision of a more comprehensive community transport system to enable older people with disabilities to access community based programs.

There are a range of barriers which increase the difficulty for older people to participate in physical activity, including environmental barriers. Environments (for example, parks, footpaths and shopping centres) should be designed and built to be supportive of physical activity participation by older people. Important considerations include access, safety, lighting, seating availability, and walkway surfaces. Ensuring physical activity friendly environments for older people will improve the likelihood of participation.

Services: comprehensive, coordinated and sustainable

Structural support is needed from State and Commonwealth governments for service providers. It is telling that, despite the existence of a national quality framework for exercise referral schemes in the UK (UK Department of Health 2001), Taylor et al. comment '*collaboration between health services and community physical activity programs is patchy, without any milestones and clear directives*' (Taylor, Cable et al. 2004) p719.

Local governments, community health services and the fitness industry should work to provide more physical activity classes suitable for older people, facilitated by appropriately trained staff. Where possible, a range of opportunities for different types of physical activity should be available from organisations involved in providing physical activity opportunities for older people. Different types of physical activity will achieve different types of improved abilities and outcomes for older people. Therefore, participating in programs that include components of the three main types of physical activity (fitness, strength, and balance/mobility), or undertaking separate programs which incorporate each of these individually will provide the greatest health benefit.

Physical activity can occur in a home based or an external group based program. For frail older people, or those with multiple medical problems commencing a physical activity program, supervision by a trained professional such as a physiotherapist may be useful to ensure the appropriate amount and type of physical activity is introduced. Once a person is competent in the physical activity program, there is scope for it to continue unsupervised. Educating older people about the actual risks of physical activity and assisting them to self-monitor their exercise intensity levels as part of a program will help to overcome concerns about safety.

The needs of frail older people, and those with disabilities need to be considered to maximise the opportunity to participate in physical activity options. For example, the design of residential aged care facilities should enable safe incidental physical activity to occur within the facility. Residential aged care facilities should seek to incorporate physical activity into their resident's programs.

Strategies should be undertaken to encourage older people to trial new opportunities for physical activity, and to support long term participation. If an older person is able to sustain participation in a new physical activity program for at least a month, there is increased likelihood that they will continue with the activity in the long term. Maximal benefits from physical activity programs are likely if participation is sustained for longer periods. A person is more likely to continue to be active if the physical activity program is tailored to their needs and interests. Encouraging older people to set their own short and long term goals for a physical activity program will also enhance their self-efficacy. Social support and the involvement of family and friends can improve long term participation. Strategies such as intermittent monitoring of certain health related outcomes (for example, blood pressure, balance, strength) and regular positive reinforcement can improve motivation for older people participating in physical activity programs.

Continuity of physical activity support is important. Intersectoral collaboration should occur to create, promote and sustain physical activity opportunities in a cost effective manner. Partnerships between medical professionals and local community resources are needed to help refer patients to local physical activity opportunities. For example, the benefits of hospital based rehabilitation programs need to be maintained by ensuring the provision and monitoring of home and community based programs to sustain physical activity behaviour.

Education and Training

Marketing that promotes physical activity by disseminating targeted messages about best practices and benefits is needed. Information about the health benefits of physical activity for older people, including those with existing health problems, should be widely available across a variety of media, and targeting key sub-groups. Private/public sector partnerships could be formed

to develop marketing messages targeted at specific segments of the older population. Although an increasing proportion of older Australians are aware of the health benefits of physical activity, there remain key areas where improved knowledge will increase likelihood of participation in different levels and types of physical activity. Examples include understanding that physical activity is still possible, and achieves positive health outcomes, even in the presence of moderate health problems such as arthritis or stroke. Culturally appropriate key messages also need to be disseminated widely among people from culturally and linguistically diverse backgrounds, and Aboriginal and Torres Strait Islanders. These are key groups with low levels of physical activity and high prevalence of health problems associated with low levels of physical activity, such as cardiovascular disease and diabetes.

Medical clearance for the older person to begin physical activity may not be necessary so long as their health conditions are stable, and that a *progressive* program is introduced that commences at a manageable level. For example, unless contraindicated, all people with peripheral vascular disease (PVD), diabetes or stroke survivors with sufficient residual function should progress over time to the recommended dose of physical activity.

Overall, there has been an increase in the number of physical activity programs available for older people. Alongside this growth, there has been an increase in the number of personnel trained to facilitate physical activity delivery and uptake amongst older people. People providing physical activity facilitation for older people need appropriate training, particularly for dealing with those with a range of comorbidities. The table below illustrates the numbers of people registered with Fitness Australia to work with older people.

Table 10.1 Registered fitness professionals in Australia

State/Territory	Total registrations	Older Adult/Specific Populations ¹
ACT	503	94
VIC	1364	31
QLD	3360	688
SA	680	62
NSW	4930	762
TAS	306	37
WA	1368	456
NT	66	11
TOTALS	12577	2141

¹ The Older Adults/Specific Populations figure is a combination of two registration categories. Until December 2005, Older Adults Trainers were registered in the same category as those trained for Specific Populations. In 2005 the training package changed and therefore so too did the registration categories. As of December 2005 'Older Adults Trainer' became a separate category. Due to the lag time between the change and the identification of those registered as Specific Populations and qualified as Older Adults trainers, the figure cited can only be viewed as an approximation since it includes all those registered in either category. However, it is not possible to be registered in both categories at the same time so there is no double counting of the same registration. In Victoria, personnel can also register independently with Kinect Australia, so the state figures may not be a true estimate of capacity in Victoria.

Source: Fitness Australia

Physical activity programs and opportunities for older people should be conducted by people with appropriate experience and training. With all formal physical activity programs, there is a need for appropriate training of those providing the programs to ensure safety and appropriateness of the programs. There are international curriculum guidelines for the training of physical activity instructors to work with older people (Cress, Buchner et al. 2004). Similar needs exist for those involved in providing informal physical activity opportunities for older people, such as aged care staff. Those involved need to be aware of the specific needs, precautions, and benefits of physical activity as they apply to older people.

Role of health professionals

Health professionals should promote physical activity to all their older clients to increase the prevalence of physical activity amongst older Australians. Health professionals should work together across the primary, secondary and tertiary care sectors in promoting physical activity to prevent the development of chronic conditions and to optimise their management as part of a seamless care program. Schofield and colleagues have recently confirmed the trust that older Australians have in advice received from health professionals, particularly general practitioners (GPs) (Schofield, Croteau et al. 2005), yet A US Centers of Disease Control and Prevention report stated that less than half of all patients were asked about physical activity by their healthcare providers (Centers for Disease Control and Prevention 2002). Health professionals spend very little time providing physical activity advice to clients, particularly older people [e.g. (Melillo, Houde et al. 2000)].

Another challenge is extending the reach of advice giving across GPs and other healthcare providers, so that a greater proportion of the population are exposed to physical activity information and support. A population health approach, raising physical activity levels in *all* older people would be most beneficial. Where advice is given, it tends to be targeted at high-risk individuals. The primary care based Lifestyle Prescriptions and the New Zealand Green Prescription schemes both have a population health approach. Evidence from the Victorian Active Script and Green Prescription initiatives' evaluation indicates that implementation has not been as broad as intended. Rather, doctors have tended to provide scripts to specific groups, particularly the high risk overweight people, rather than older people. A GP exercise referral pilot study in NSW (Smith, Cook et al. 2004) found that uptake of this process amongst GPs was limited. Although the intent was to target those with cardiovascular risk factors, the people being referred were predominantly those who were overweight. Opportunities for those with other risk factors were being missed. The reasons for this were not explored, but could be related to a reticence amongst GPs to consider management of chronic conditions using non-drug interventions. A broader population health, prevention approach to the use of the Lifestyle Prescriptions scheme and the exercise item in the older person's health check (MBS item), and during routine health checks for chronic conditions needs to be encouraged amongst health practitioners.

General practitioner engagement in association with the Rockhampton 10,000 Steps campaign has been more promising (Eakin, Brown et al. 2004). Practices displayed posters, used brochures and loaned pedometers as well as providing direct advice during consultations. As part of the evaluation, telephone surveys of patients found that significantly more of the Rockhampton community recalled receiving advice on physical activity from their GP in contrast to the comparison community (31% increase in likelihood, 95% CI 1.11-1.54, vs. 16% decrease, 95% CI 0.68-1.04).

Whilst health professionals can be effective in providing advice to their clients, many will benefit from the availability of user-friendly clinical guidelines. Several such documents exist [e.g. (Christmas and Andersen 2000)] and a selection of resources is provided in Appendix 7.

Translation of evidence into practice

We note that for the translation of evidence into practice to occur, there is a need to reflect upon the feasibility of transferring interventions found to be successful in effectiveness studies into routine daily life/situations. Feasibility will be determined by factors such as the availability of behavioural facilitators, both health professionals and exercise instructors. The cost effectiveness of formal programs also requires consideration.

Whilst there is a large literature on physical activity interventions and their impact on health outcomes, the degree to which the findings are generalisable to older Australians is less clear. Firstly, many studies have used screening processes that have excluded those with pre-existing medical conditions, resulting in more healthy samples. For example, in the CHAMPS study,

participants had high baseline levels of physical activity, limiting the generalisability of the findings (Stewart, Mills et al. 2001). Secondly, the intensive screening may have deterred some from participating, making for a highly motivated group undergoing the actual intervention. Thirdly, as noted by Hillsdon and colleagues (Hillsdon, Foster et al. 2005), the complexity of many interventions would limit the extent to which they could be routinely delivered in Australian health and community settings.

Surveillance

In order to track the impact of the physical activity recommendations on older Australians' physical activity behaviour we need to conduct surveillance and monitoring. As we have seen, the older population is a particularly heterogeneous group, with varying capacity to engage in physical activity. The national physical activity surveys to date have included older people, but the data has largely been reported in aggregate fashion. Even an age band such as '75 years and over' can contain more than one generation of older person. A more detailed breakdown of the older population would be helpful, to see which groups may need further targeting. There is scope to distinguish between community dwelling older people and those living in residential care.

The Active Australia survey helps in making intergenerational comparisons. For specific monitoring of the older population, it will be necessary to use instruments shown to be valid and reliable with this population sector. A discussion of measurement considerations is provided in Appendix 4.

Economic evaluation

Although there is a wealth of evidence to support the uptake of physical activity, at a societal level we need to consider the costs associated with providing programs. In line with the rationing of health care, economic analyses of physical activity interventions is needed. Here, the evidence is scarce. Take for example a recent Netherlands trial of a high intensity exercise program for people with rheumatoid arthritis (van den Hout, de Jong et al. 2005). The clinical outcomes, measures of functional status, demonstrated that the program was significantly superior to usual care, namely individual therapy from a physiotherapist. When cost utility analyses were conducted, the utility measures failed to replicate the benefit in financial terms. Based on a 'societal willingness to pay' criterion, usual care had better cost utility. Any reductions in medical costs from health improvement were not wholly offset by costs associated with the program. The authors note that although more than half continued the program at their own expense, as a cost effective model it failed. Nicholl and colleagues have estimated that in Britain, participation in physical activity by older people leads to an annual healthcare cost benefit of over £20 per person (Nicholl, Coleman et al. 1994). Stevens et al. (1998) estimated that it would cost £2,500 to move an adult to the recommended physical activity levels and £600 to move them from sedentary behaviour. Huang et al. (2004) estimated that the amounts saved by the Active Script program, where Victorian general practitioners provided brief advice and an exercise prescription, were \$138 per patient to become sufficiently active to gain health benefits and \$3,647 per DALY saved. There is solid economic evidence for the use of physical activity counselling in general practice (Elley, Kerse et al. 2004; Dalziel, Segal et al. 2006): this type of analyses is needed for other physical activity interventions.

Although the costs of providing physical activity programs for older people may be higher, given the level of training and supervision required to ensure safe practice, the potential gains may be greater, given the older person's greater absolute risk for a range of health conditions. The existing economic data for practical reasons relates to a limited number of health measures, whilst epidemiological evidence indicates that health and societal benefits can be multiple.

Research gaps

Further research should be supported to address key gaps in the evidence base about effective physical activity options for older people. Although there has been substantial growth in the research evidence supporting physical activity benefits for older people in recent years, there

remain a number of areas where further research is required. A key area for future research is to evaluate innovative strategies to achieve effective translation of the research evidence into widespread practice, including for specific sub-groups, for example older people with complex health problems, those from culturally and linguistically diverse backgrounds, and Aboriginal and Torres Strait Islanders.

Improved understanding of ways to maximise uptake and sustained engagement of older people in physical activity is also required. Individual behaviour change occurs within the context of one's social and physical environment. Future research needs to evaluate the relative impact of societal and structural changes upon individual physical activity behaviour and health outcomes.

From a biopsychosocial perspective, some key research questions to be addressed are:

- What is the minimum amount of physical activity needed to promote health benefits in older people, and what are the relative changes in outcomes achieved for different dosage of physical activity?
- What are the best strategies for sustaining engagement in physical activity behaviour over periods longer than a year?
- What are the gender and cultural differences in responding to physical activity programs that need to be considered in the development of tailored options?

For future research and policy we need to go beyond traditional effectiveness studies to examine the contextual factors that influence the success of physical activity promotion in older people. We need to establish whether findings from efficacy studies can be replicated in implementation studies in Australian community and residential care settings. We also need to evaluate the influence of social and structural factors upon individual level behaviour change to assess their relative predictive value.

Methodological weaknesses in the existing evidence base also need to be addressed. These include:

- Small sample sizes.
- Limited sociodemographic characteristics of study participants.
- Lack of follow-up, particularly longer term.
- Inappropriate outcome measurement tools for older people.
- Mismatch between intervention focus and outcome measures used e.g. resistance training is less likely to influence measures of cardiorespiratory fitness.
- Aggregation of findings about older people into broad chronological age groups rather than relating to baseline functional status.

Summary

There is a wealth of evidence that supports the efficacy of a range of physical activity forms in promoting health and wellbeing. We have less evidence about how societal and structural factors impact on physical activity behaviour. We need more evidence for how effective interventions are when they are transferred into routine care settings in the home, community, primary care, and residential care settings. We also need to pay attention to participants receiving a dose of physical activity sufficient to attain health benefits: this will require greater focus upon adherence strategies.

It is hoped that the current document and draft recommendations can assist in guiding best practice for the promotion, uptake and sustainability of physical activity for older Australians.

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Appendix 1 Stakeholders consulted

Active Ageing Australia
Age Concern
Aged and Community Services Australia
Aged Care Association
Alzheimer's Australia
Arthritis Australia
Australian Government Department of Health and Ageing
 - Food and Healthy Living Branch, Population Health Division
 - Office for an Ageing Australia, Ageing and Aged Care Division
Australian Government Department of Veterans' Affairs
Australasian Society for the Study of Obesity
Australian Association of Exercise and Sport Science
Australian Association of Gerontology
Australian Institute of Urban Studies
Australian Medical Association
Australian Physiotherapy Association
Australian Society for Geriatric Medicine
Australian Sports Commission
Beyond Blue
Blueearth Institute
Cancer Council Australia
Centre for Physical Activity & Nutrition, School of Exercise & Nutrition Sciences,
 Deakin University, VIC
Centre for Applied Social Marketing Research, Edith Cowan University, School of
 Marketing, Tourism and Leisure, WA
Council On The Ageing -VIC - national office closed
Department of Health and Community Services, NT
Department of Human Services (Victoria)
Diabetes Australia
Eudunda & Kapunda Health Service Inc (rural high care facility), SA
Federation of Ethnic Communities' Councils of Australia
Fernwood Women's Health Clubs
Fitnation
Fitness Australia
Health Psychology - Australian Psychological Society
Health Promotion Branch, Department of Health, SA
Health Promotion Unit, Population Health Services, Queensland Health, QLD

Hervey Bay City Council, QLD
Hill View Aged Care Facility, NSW
Human Kinetics Australia
Kinect
Knowledge Management Programs, SA
National Asthma Council
National Heart Foundation
National Seniors Association
National Stroke Foundation
Northern Sydney Health Promotion, NSW
Older Adult Program Manager, ACT
Population Health Policy Branch, Department of Health, WA
QEI Jubilee Hospital, QLD
Repatriation General Hospital, SA
Royal Australian College of General Practitioners
Sports Medicine Australia
The Blueearth Institute
VicHealth
YMCA Fitness Training

***Note: Includes respondents to consultation surveys**

Appendix 2 Websites searched

Ageing Research Online

APAIS

AusportMed

Australian Association of Gerontology

Canadian Health Promotion Development Section

CDC Physical Activity Website

CINAHL

Cochrane Library (Central Register of Controlled Trials, and relevant specialised registers including the Musculoskeletal Injuries Group),

Current Contents

DRUG

EMBASE

MEDLINE

National Aboriginal and Torres Strait Islander Health Clearing House

National Aboriginal Community Controlled Health Organisation

National Guideline Clearinghouse

NHS Centre for Reviews and Dissemination

PsychINFO

PUBMED

World Wide Web (Google)

Appendix 3 Search strategies employed

The following strategy employed was used to search MEDLINE and was modified for use in other databases:

1. physical activity.mp. or *Motor Activity/ 35649
2. exertion.mp.
3. physical fitness.mp.
4. "physical education and training".mp.
5. sports.mp. or *Sports Medicine
6. dancing.mp.
7. exercise therapy.mp.
8. (physical\$ adj5 (fit\$ or train\$ or activ\$ or endur\$)).tw.
9. sport\$.tw.
10. walk\$.tw.
11. bicycle\$.tw.
12. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12
13. elderly.mp. or *Aged
14. *Old Age Assistance/ or old\$.mp.
15. aged.mp. or *Homes for the Aged/ or *Aged, 80 and over"/ or *Health Services for the Aged/ or *Aged
16. *Nursing, Supervisory/ or *Housing for the Elderly/ or *Aged/ or *Health Services for the Aged/ or senior.mp.
17. *Age Factors/ or *Aged, 80 and over"/ or *Aged/ or older.mp. or *Aging
18. 13 or 14 or 15 or 16 or 17
19. trial.mp. or *Randomized Controlled Trial [Publication Type]/ or *Clinical Trial [Publication Type]/ or *Clinical Trial, Phase II [Publication Type]/ or *Clinical Trial, Phase IV [Publication Type]/ or *Clinical Trial, Phase I [Publication Type]/ or *Clinical Trial, Phase III [Publication Type]/ or *Controlled Clinical Trial [Publication Type]"
20. *Review Literature"/ or systematic review.mp. or *Meta-Analysis
21. review.mp. or "Review [Publication Type]"
22. 20 or 21
23. cardiovascular disease.mp. or *Cardiovascular Diseases
24. *Diabetes Mellitus, Experimental/ or *Diabetes Insipidus, Nephrogenic/ or *Diabetes Mellitus, Lipoatrophic/ or *Diabetes Mellitus, Type 2/ or *Diabetes Insipidus/ or *Diabetes Mellitus, Type 1/ or *Diabetes, Gestational/ or *Diabetes Insipidus, Neurogenic/ or *Diabetes Complications/ or diabetes.mp. or *Diabetes Mellitus
25. *Dementia, Vascular/ or *Delirium, Dementia, Amnestic, Cognitive Disorders/ or *Dementia, Multi-Infarct/ or *AIDS Dementia Complex/ or *Dementia/ or dementia.mp.
26. *Accidental Falls/ or *Nursing Homes/ or *Mental Disorders/ or *Institutionalization/ or *Aged/ or *Behavioral Symptoms/ or *Residential Treatment/ or *Mental Retardation/ or *Residential Facilities/ or residential care.mp. or *Homes for the Aged
27. *Education, Special/ or *Transcultural Nursing/ or *Cultural Characteristics/ or *Cultural Diversity/ or *Minority Groups/ or culturally diverse.mp. or *Jews/ or *Ethnic Groups
28. *communication barriers/ or *information dissemination/ or *language/ 9801 27 *Geriatric Assessment/ or *Activities of Daily Living"/ or *Health Services for the Aged/ or *Frail Elderly/ or *Long-Term Care/ or frail.mp. or *Homes for the Aged/ or *Urinary Incontinence
29. limit 28 to (humans and english language and yr="1990 - 2006")

Appendix 4 The measurement of physical activity in older people

There are several areas of weakness within the existing literature on physical activity in older people. The first concerns the robustness of studies conducted, particularly the design and sampling aspects of the methodology. Robustness is a challenge for all studies, not just those involving older people. Secondly, there are relatively few reviews that focus specifically on older people, raising concerns about the generalisability of studies of the overall adult population. Thirdly, there has been relatively limited use of data collection instruments specifically designed for use with older people. These influences upon the interpretation of data from the evidence base were noted throughout the production of this discussion document and are briefly discussed below.

Common methodological limitations

Methodological weaknesses highlighted in the general physical activity literature also pertain to studies involving older people. The limitations include: small samples, lack of detail regarding the intervention, variable means of recording physical activity behaviour, absence of intention to treat analyses and limited follow-up periods. All impact on the validity and generalisability of the findings and make cross-study comparison difficult.

Whilst a statistical or clinical benefit may be reported, there is often little reference to whether national guideline criteria have been met, i.e. whether the physical activity behaviour level is sufficient to produce health benefits overall. Indeed, several studies with older people may have reported statistically significant differences between intervention and control groups, but the additional amount of physical activity achieved may be relatively modest.

There is also limited evidence for the sustainability of physical activity behaviour change and associated health outcomes over time. Recent reviews of physical activity programs for older people have reported that the impact is often short term and relatively small (van der Bij, Laurent et al. 2002). Notable exceptions are the CHAMPS study, which had a one year follow-up (Stewart, Mills et al. 2001) and Campbell et al's home based falls prevention exercise program that had a two year follow-up period (Campbell, Robertson et al. 1999).

Internal and external validity: generalising to older people

Two fundamental methodological issues hamper the evidence for physical activity promotion in older people. Firstly, there are relatively few reviews that focus specifically on older people. For example, the recent Cochrane review (Hillsdon, Foster et al. 2005) included four studies that focused on older people. Seven had samples with a maximum age of sixty or below and the remaining ten contained people 60 or above. Some provided a maximum age, but more often the paper only states 60+, which does not allow for any discrimination across the older adults represented. Where studies have included older people, it is not always possible to determine the intervention's impact on this sub-group. Only one study (Stewart, Mills et al. 2001) compared outcomes between those above and below 75 years old: no difference in outcomes between the two age groups was reported.

Secondly, many studies have used instruments meant for the general adult population. Details of physical activity are key in older people. For example, the absolute intensity of activity measured on a scale may not reflect the relative underlying capacity of the person to exercise. To date, only four instruments have been developed for use with older people (Washburn 2000). These are the Physical Activity Scale for the Elderly (PASE) (Washburn, Smith et al. 1993), the Yale Physical Activity Survey (DiPietro, Caspersen et al. 1993), the Zutphen Physical Activity Questionnaire (Caspersen, Bloemberg et al. 1991) and the Modified Baecke Questionnaire for Older Adults (Baecke, Burema et al. 1982). The instruments have been psychometrically tested and are reasonably robust, but further testing is needed. Objective measures, such as calorimetry and doubly-labelled water techniques, are likely to be infeasible in community implementation trials. Self-report measures are impeded by recall and over-reporting bias. Further, the instruments have often been designed for males living in Western cultures, so their appropriateness for not only older people, but women and those from CLDB backgrounds, is unclear (Seefeldt, Malina et al. 2002). Evaluation of the impact of

future programs clearly requires accurate measurement of physical activity behaviour, using measures appropriate for a multicultural older population.

A recent systematic review (Jorstad-Stein, Hauer et al. 2005) found that none of the currently available tools is wholly suitable for future trial usage. They recommended that new tools be developed, or the more robust ones, such as the Stanford 7-day Physical Activity Recall and the Community Health Activities Model Program for Seniors Questionnaires, be further developed.

Thirdly, the heterogeneous nature of the older population makes measurement challenging even when age relevant tools are used. This is because disability and impairments associated with chronic disease can influence the conduct of physical activity and the reporting of its duration and intensity. For example, it can take longer for a mobility impaired person to walk a set distance and it can involve more effort. This means that their reporting of such activity can be skewed to make it appear to be longer and of greater intensity than in a healthy person. Thus it is preferable to focus on the frequency of physical activity rather than duration or intensity. Alternatively, data could be adjusted according to the person's functional status.

In summary, measurement limitations impact on our ability to assess the effectiveness of physical activity interventions and different people's responses thereto. Measurement tools have given us some understanding of physical activity patterns and barriers to physical activity. There is an ongoing need for methodologies that allow researchers to capture why people do maintain physical activity behaviours, so that this information can be used in motivating others.

Appendix 5 Randomised controlled trial and review articles

Table A5.1 Randomised controlled trials: residential care setting

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/weaknesses
Hauer 2002 Germany	To assess the feasibility, safety and efficacy of intensive, progressive physical training in rehabilitation after hip surgery.	3 month intensive progressive resistance and functional physical training 6-8 weeks after hip surgery.	28 (15 intervention, 13 control) elderly patients with history of injurious falls in acute care or inpatient rehab due to fall-related hip fracture or elective hip replacement. Over 75 years.	RCT	Baseline, 3 months (end of training) and 6 months -muscle strength -functional performance -training events -training adherence -physical activity -emotional status	Training increased strength, functional motor performance and balance and reduced fall related behavioral and emotional problems. Training improvements lost after stopping training.	Patients need at least partly preserved functional ability to take part in training. No mention of patient allocation, including whether blind.
Becker et al. 2003 Germany	To determine the effectiveness of a multifaceted in effectiveness of the complete multi-faceted intervention on falls in a nursing home residents.	Multifactorial intervention involving staff and resident education, advice on environmental adaptations, exercise, and hip protectors.	981 residents from 6 long term care facilities (nursing homes) aged 60 and older (mean age 85 years).	RCT	Falls rate Fracture rates	The intervention group demonstrated a significantly lower rate of falls ($p<0.001$), fallers ($p=0.038$) and frequent fallers ($p=0.015$) than the control group. There were no significant difference found between groups for rate of hip fractures.	
Gillies et al. 1999 UK	To investigate the effect of a 12 week exercise program on the functional status of institutionalised elderly people.	Circuit of functional exercises twice/week for 12 weeks. Compared to reminiscence plus seated range of movement exercises for trunk and upper limbs.	Residents from 2 nursing homes ($n = 15$, mean age 88 years).	Cluster RCT	Distance walked in 15 seconds, Timed up and go, Timed stair ascent and descent	Significant improvements on all outcomes for intervention group. Controls improved stair ascent and single chair rise. Significant group difference in walking.	Small sample size: underpowered given attrition rate. Good adherence (92%). No exercise related injuries reported.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/weaknesses
Jensen et al. 2002 Sweden	To determine whether a multifactorial intervention program would reduce falls and fall-related injuries.	An 11 week multidisciplinary multifactorial program including staff education, environmental modification, exercise, supply or repair of aids, medication review, hip protectors, post-fall problem-solving conference and staff guidance. Compared with usual care control group.	439 residents from 9 residential care facilities, aged 65 and over.	Cluster RCT	Falls rate Time to first fall Fractures	The intervention group had significantly fewer fallers and the time to first fall was longer than the control group. When adjusted for baseline factors the intervention group had significantly fewer multiple fallers and falls per 1000 person days. Significant difference between the intervention and control groups for having a femoral fracture (adjusted OR=0.23, 95% CI=0.06-0.94).	
Lazowski et al. 1999 Canada	To improve strength, balance, mobility, flexibility and function using a tailored exercise program	Walking, strengthening and balance exercises 45 minutes 3 times/week for 4 months. Compared with seated exercises to improve range of movement.	Residents of a long term care institution (n= 68, mean age 80 years).	RCT	Functional independence (FIM), Timed up and go, Stair climbing, Upper and lower body flexibility, Upper and lower limb strength, Gait speed, Balance	Intervention group had significant improvements in mobility, balance, flexibility, knee and hip strength. Range of motion group had improved shoulder strength.	Interventions required minimal training of staff and volunteers.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/weaknesses
Morris et al. 1999 US	To evaluate how weight training or nurse-based rehabilitative care programs in nursing homes impact on residence performance of activities of daily living and objective tests of physical performance	PRT (2 sets of 8 repetitions) 3 times per week; walking on alternate days. Compared with tailored nursing rehabilitation intervention designed to maintain function/prevent decline. Control group received usual care.	Nursing home residents (n = 468, mean age 84.7 years, 79% female) from six nursing homes.	Cluster RCT	Function: ADL and Minimum Data Set assessment summary Strength: Timed sit to stand Endurance: 6 minute walk Balance: Time standing in five positions Mood: Geriatric Depression Scale	Intervention groups had significantly reduced declines in function, in particular early and late loss ADL and locomotion	Able to compare exercise types. No evidence of cluster analysis.
McMurdo and Rennie 1993 Scotland		Upper and lower limb strengthening exercises 45minutes twice/week. Compared to same frequency program of music and reminiscence therapy designed to promote social interaction. 7 months.	Residents of 4 nursing homes (n = 49, mean age 80 years).	Cluster RCT	Barthel ADL Knee flexion/extension, Spinal flexion, Sit to stand time, Grip strength, Balance, Life Satisfaction Index, Geriatric Depression Scale, MiniMental	Significant improvements in exercise group for grip strength, spinal flexion, sit to stand ADL and depressive status.	Average attendance was 91% for exercise program and 68% for the reminiscence sessions. Eight lost to follow up due to death (5 in exercise group) and 3 of control group due to lack of interest.
Meuleman et al. 2000 US	To assess the impact of exercise training on strength, endurance and functional status in debilitated older people	Resistance training 3 times/week, with twice weekly cycle ergometry for 4-8 weeks. Compared to usual care.	Residents of 2 nursing homes (n= 78, mean age 75 years).	RCT	Strength in dominant arm and leg, Mobility (self selected walk speed) Cardiovascular fitness (timed endurance test) IADL, ADL, Geriatric Depression Scale	Trends for greater improvement in strength and function in intervention group. Those with least function at baseline showed the greatest improvements.	Only one person withdrew due to injury.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/weaknesses
Mulrow et al. 1994 US	To assess whether a tailored physical therapy program improved physical function and self perceived health	One on one tailored program 3 times/week for 4 months. Compared to visit to read to resident 3 times/week for 4 months.	Residents of 9 nursing homes (n = 194, mean age 80 years).	RCT	ADL, Physical Disability Index (PDI) Range of movement, Mobility, Upper and lower limb strength, Sickness Impact Profile (SIP) Geriatric Depression Scale, Falls, MiniMental	No significant group differences on PDI, ADL or SIP. Intervention group used assistive devices less. No difference in falls rates (79 vs 60).	Program facilitated by an English or Spanish physiotherapist, as appropriate. Good adherence (89% and 92% sessions for intervention and controls respectively). Cost \$1220 on average, compared with control \$189.
Rubenstein et al. 2000 US	To assess the effectiveness of an exercise program in reducing falls in at risk older men	Usual care vs. 12 week low to moderate intensity program including strength, endurance and balance exercises	Ambulatory men with at least one falls risk factor (n = 59)	RCT	Falls rate Endurance Gait Balance Strength (hip, ankle) Physical function	Intervention group had significantly lower three month fall rate (adjusted for activity level)- 6 falls/1000 hours activity vs 16.2 falls/1000 hours of activity Intervention group had significant improvements on gait and endurance measures.	
Sauvage et al. 1992 US	To assess the impact of a resistance and aerobic exercise program on mobility, strength and endurance in frail older men	Lower limb PRT and cycle ergometry 3 times/week for 12 weeks. Compared with usual care	Residents from one nursing home (n = 14)	RCT	Tinetti mobility test, Gait, Strength testing, Balance, Maximum oxygen consumption	Intervention group had significantly improved mobility scores, endurance, left stride length and gait velocity.	Small sample size. Clinical significance of results to be questioned as only 5-10% above baseline

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Simons 2006 US	To assess the effects of two types of exercise on multiple measures of functional fitness	Walking (self paced, progressive pace and duration) or PRT (One set 10 reps at 75% 1 RM for 6 exercises) versus control. Twice/week for 16 weeks.	64 older people (45 women, 19 men) from supported residential care. Aged 66-96 mean 83.5 years.	RCT	Upper and lower body strength Flexibility Agility Balance	Pre-post within exercise group improvements. Walking and resistance training significantly improved functional health compared to controls, particularly upper body strength (20% more improved than controls).	Walking achieved similar improvements to PRT when compared to controls (no between group analyses). No follow-up. Attrition 10%. Participants encouraged to attend healthy ageing classes? intervention?
Shaw 2003 UK	To assess the effectiveness of a multifactorial assessment and interventions for older people with cognitive impairment presenting at ED after a fall	Usual care vs. medical, physiotherapy and occupational therapy assessment, referral to interventions based on assessment.	People presenting to A&E with a fall who were not hospitalized. 80 % from residential care units.	RCT	One year follow up Falls rate Falls injuries	Trend for fewer falls and falls related injuries in intervention group.	Specific impact of exercise not ascertained
Resnick 2002 US	To assess the feasibility of a multifaceted walking and behaviour change program and determine its effects on self efficacy, outcome expectations, activity, health, falls and falls-	6 month program . Goal to walk for 20 minutes three times a week alone or in a group. Supported by nurse who monitored progress weekly in first month, then monthly	20 sedentary older women in retirement community (assisted living). WALC vs. routine care. Mean age 88 (+/- 3.7 years)	RCT	Baseline, 2 and 6 month post-program initiation -self efficacy - outcome expectations -exercise and free living activity -health status -falls and falls-related injuries	Intervention group had increased self-efficacy, more exercise and overall activity and showed a trend for stronger outcome expectations	90% of intervention group initiated and continued to exercise regularly. 15% attrition due to illness. 2/10 used existing walking group, indoor walking Calendar cue used to measure exercise behaviour (intervention not

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
	related injuries						controls) Falls self reported Small sample size- underpowered for some outcomes

Table A5.2 Randomised controlled trials: Community setting

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/weaknesses
Barnett et al. 2003 Australia	To determine whether participation in a weekly group exercise program with ancillary home exercises improves balance, muscle strength, reaction time, physical functioning, health status and prevents falls in 'at risk' community dwelling older people.	Intervention: Weekly structured exercise group run in a community setting conducted by an accredited instructor. 1 hour classes over 4 terms for 1 year (37 classes) with progressive work, included provision of home program with diaries to record participation, and received information re practical falls prevention strategies. Control: Received written information about falls prevention strategies. 1 year	Community dwelling older people (n=163); aged > 65 years and identified as 'at risk' of falling.	RCT	Falls rate Balance Strength Reaction time Walking speed SF36 PASE Fear of Falling	Intervention Group: - performed significantly better than the control group in three of six balance measures (but not in measures of strength, reaction time and walking speed or on Short-Form 36, Physical Activity Scale for the Elderly or fear of falling scales). - the rate of falls was significantly (40%) lower than the control group (IRR=0.60, 95% CI 0.36-0.99). - had non-significantly (34%) fewer injurious falls and a lower proportion of fallers than controls.	
Binder et al 2002 US	To evaluate whether a multidimensional exercise training program can	Intervention: group exercise 3 times per week Control: home based low	115 sedentary frail, community dwelling adults (mean age 83 years)	RCT	Physical performance, peak oxygen uptake, ADL, IADL,	Intervention group had significant improvements on physical performance, peak oxygen uptake, functional status compared to controls	Intensive pre-screening produced a selective sample. Unclear whether

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
	significantly reduce frailty in community dwelling older men and women	intensity (flexibility) program. 9 months			functional status		findings transferable into routine practice. Participants given free transport to training.
Blumenthal 1999 US Babyak 2000 US	To explore the adjuvant effects of aerobic exercise in older depressed people	16 wks aerobic exercise. Compared with antidepressants and aerobic exercise or antidepressants alone.	Older people (n = 156, with 133 at follow up, aged 50 years or over) with major depression.	RCT	Depression	Exercise equivalent efficacy to medications. Treatment adherence better among exercisers.	Short term follow up. No control group.
Day et al 2002 Australia	To determine the effectiveness of three interventions to prevent falls among older people and explore the interactions between them.	Interventions: Exercise, home hazard modifications, vision improvement (combined into 8 groups defined by the presence/absence of each intervention). 18 months follow-up.	1090 people aged 70 and over living at home in the City of Whitehorse. Most were Australian born, aged between 70-84 and rated their health as good.	RCT	Falls rate	The strongest effect that was observed was for all three interventions combined (rate ratio 0.67 (0.51 to 0.88, P=0.004). Significant benefit for exercise alone (rate ratio for exercise was 0.82 (95% confidence interval 0.70 to 0.97, P=0.02), and a significant effect (P<0.05) for the combinations of interventions that involved exercise. Home hazard management and vision improvement showed no significant effect.	

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Dubbert 2002 US		STEPS program. All received baseline brief advice from nurse about increasing walking (aim: 3x20 minutes per week). Two intervention arms received follow-up support a) 20 nurse-initiated calls or b) 10 nurse-initiated calls plus 10 motivational calls using automated phone system.	Primary care patients (n=212, 60-80 years old, mostly male), independent living	RCT	Walking: activity diaries, interviews, 7-day PAR questionnaire, endurance, mobility, SF36, falls, injuries, healthcare utilisation.	All groups improved walking and fitness from baseline. Nurse plus automated calls walked significantly more frequently than those with no phone contacts. No change in quality of life.	85% (181/212) of randomised patients completed 12 month follow-up. No evidence of increased adverse events
Engel & Lindner 2006 Australia	To explore whether using a pedometer would increase time spent walking in older people with type 2 diabetes	Interventions: Coaching (education, goal setting, motivational and support strategies) without or without pedometer.	57 older (mean age 62 years) overweight people with type 2 diabetes.	RCT	Time spent walking, HbA1c, blood pressure, 10 m shuttle, BMI	Time spent walking was greater in the coaching only group. There were improvements in weight, waist circumference and cardiovascular fitness for both groups.	Confirms physiological benefits of physical activity. Small sample.
Kriska et al. 1986 US	To explore compliance with a brisk walking program designed to reduce bone loss	Supervised brisk walking, 3 miles 3 times/week. Compared to usual care group.	229 women aged 50-65 years	RCT	Paffenbarger physical activity survey, Caltrac monitor	Intervention group significantly more active at 1 and 2 year follow up. Compliers tended to be more active, non-smokers, lower weight at baseline. Compliers had significantly less illness.	Cause and effect of health status not clear. No analysis of unique impact of prompts and incentives used.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Duncan et al. 1998 US	To develop a home based balance, strength and endurance program, evaluate the ability to recruit and retain stroke subjects and to assess the effects of the interventions used	8 week, 3 times per week supervised home based balance, strength and endurance program.	Minimally and moderately impaired stroke patients 30-90 days post stroke	RCT	Upper and lower extremity motor function, 6 minute walk, Berg balance score, Jebsen test of hand function, Barthel Index, Lawton IADL scale	Improvements in neurological impairment and lower extremity function. Found that many didn't have sufficient space in their home to do walking component so introduced cycle ergometers- feasibility implications	Small study. Underpowered.
Li et al. 2005 US	To determine the effectiveness of 24 form Yang style tai chi in reducing falls among older people.	Intervention: 24 form Yang style tai chi, 3 times weekly for 6 months. Control group undertook a stretching / relaxation program 3 times weekly for 6 months	256 physically inactive community dwelling adults (aged > 70 years), 70% female.	RCT	Falls, multiple falls, injurious falls, Berg Balance Scale, Dynamic Gait Index, Functional Reach, single leg stance, Timed Up and Go, 50 foot walk, fear of falling	Two groups comparable at baseline. At six months, significantly fewer falls occurred in the tai chi group (38 vs 73), with greatest effect achieved after 3 months of training. Also significantly fewer injurious falls in the tai chi group (7 vs 17). Significantly longer time to first fall in tai chi group. Significant intervention effect for the tai chi group on all dynamic balance measures, and significantly lower fear of falling. Benefits appeared sustained six months after end of formal program.	Median compliance of both programs was 61 of a total of 78 sessions (78%). Prospective recording of falls using falls calendars. Limitations included some assessors being aware of some participant's intervention status, as well as the high proportion of people screened not being eligible for the project (62%).

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Lord et al. 2003 Australia	To determine whether falls could be prevented in frail older people living in retirement villages using group exercise designed to improve activities of daily living.	Intervention: group exercise (most weight-bearing exercises), consisting of one hour/twice weekly classes over a 12 month period. Control: Two groups, one attending a one hour/twice weekly flexibility and relaxation classes and one not taking part in any group activity.	551 frail older people living in retirement villages (self-care and intermediate-care) aged 62-95.	RCT	Falls rate Reaction time Walking test Knee extension strength Standing balance	At six month retest the exercise group performed significantly better in simple and choice reaction time and 6 minute walk tests, though not in knee extension strength and standing balance. At one year follow-up, adjusting for age and gender, there were 22% fewer falls in the exercise group than the combined control groups and 31% fewer falls in the 173 subjects with a history of previous falls.	
Mather 2002 UK	To assess the impact of exercise on depression in older people not responding to medication.	Group exercise 2/week for 10 weeks; chiefly weight bearing exercise. Compared with health information sessions	86 people, median age 63 and 65 years respectively for exercise and control group	RCT	Depression	Greater proportion (55% vs. 33%) less depressed post intervention in exercise group (OR=2.51, P=0.05, 95% CI 1.00-6.38), defined as a reduction in Hamilton score from baseline of 30% or more. Difference persisted to 24 week follow up	Generalisable to those poorly responsive to antidepressants. All participants were also on antidepressants. 100% compliance with programs. No adverse events.
McLafferty et al. 2004 US	To explore the effects of resistance training on measures of mood in healthy older men and	24 weeks of PRT. 3 times/week at high intensity (80% 1RM) or variable intensity (50-80% 1RM).	28 healthy sedentary older people (mean age 67 years).	Pre-post	Profile of Mood States	Both groups had significant improvements on confusion, tension, anger and total mood scores.	Study underpowered. Sample healthy, not clinically depressed.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
	women.						
Manson et al. 2002 US	To compare the roles of walking and vigorous exercise in the prevention of coronary and cardiovascular events in a large ethnically diverse cohort of postmenopausal women.	6 year follow up of physical activity and coronary and cardiovascular events in women free from CHD and cancer at baseline	Womens Health Initiative study participants aged 50-79 years	Prospective Cohort	Walking Vigorous activity Coronary events CVD risk factors	Significant inverse association between physical activity and risk of a) coronary disease and b) cardiovascular events, with trends across quintiles of METS, walking and vigorous activity respectively. Brisk walking and vigorous activity reduce the incidence of coronary disease by up to 30% across ethnic groups of differing ages and body mass.	Ethically diverse cohort but analyses simplified to white vs. black.
McNeil 1991 US	To assess interventions to improve depressive status in older people	Accompanied walking. Compared with social visits and usual care control group.	Older people with moderate levels of depressive symptoms (n = 30)	RCT	Depression	Social visits and walking reduced depressive symptoms. Walking also reduced somatic symptoms.	Small sample.
Penninx 2002 US	To evaluate the benefits of aerobic exercise in older people with knee osteoarthritis.	Group based aerobic exercise. Compared with health education.	Older people with knee osteoarthritis (n = 439, 60 years or over). Not clinically depressed.	RCT	Depression	Aerobic exercise reduced depressive symptoms in both high and low level depression. No effect for resistance training.	18 month follow up.
Robertson et al. 2002 New Zealand	To evaluate the effect of a home-based exercise program and identify subgroups most likely to benefit.	Individually prescribed muscle strengthening, balance retraining program.	Community dwelling adults	Meta-analysis of RCTs	Falls rate Falls injuries	Falls and falls related injuries significantly lower in exercise group. Those over 80 years most likely to benefit	

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Singh et al. 1997, 2001 USA	To evaluate the long term impact of a progressive resistance training program in older people with clinical depression	High intensity progressive resistance training 3 times/week for 10 weeks supervised then 10 weeks unsupervised. Compared with health education lectures.	Community dwelling older people with clinical depression (n = 32, mean age 71.3 years).	RCT	Depression	73% of intervention group no longer depressed at 20 weeks, compared to 36% of control group. The depression score was significantly improved at both 20 weeks and 26 months follow-up. Improved self efficacy and morale.	Contacted weekly for 20 weeks. Choice of continuing exercise venue. Shows benefits of ongoing unsupervised activity. Small sample.
Song et al. 2003 South Korea	To evaluate the effectiveness of a special version of tai chi (Tai chi for Arthritis) in improving function and reducing symptoms for people with arthritis.	The intervention consisted of a 12 form version of Sun style tai chi once weekly for 12 weeks.	72 older women with osteo-arthritis.	RCT	Physical symptoms, body mass index, cardiovascular functioning, self perceived difficulties in physical function.	The tai chi group achieved significantly less pain and stiffness in their joints, reported fewer difficulties in physical functioning, relative to the control group who either had no change or deterioration in these measures. Program was well tolerated by patients with osteo-arthritis.	Moderate (41%) drop-out rate. Analyses limited to univariate analyses. Functional improvement based on self report rather than observation.
Toshima et al 1990 USA	To evaluate a comprehensive rehabilitation program	Intervention: 12 four hour sessions over 8 weeks. Education, psychosocial support and individualised walking program. Controls: Four bi-weekly meetings education only. 6 month follow up.	119 COPD patients (32 female, mean age 62.6 years)	RCT	Exercise endurance, quality of wellbeing, depression and self efficacy	Increases in exercise endurance significantly greater in intervention group. Self efficacy also tended to be greater in the intervention group.	Limited attrition- 89% underwent the 6 month follow-up. Patients were required to make up any sessions they missed.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Wolf et al. 1996 USA	To evaluate the effect of Tai Chi and computerised balance training on measures of frailty and falls.	Intervention (Tai Chi): Tai Chi Quan in group classes, with encouragement to practice at home Intervention (Balance Training): Individual sessions using computerised balance machine Control Group discussion (non-specific): with no change to exercise levels	Community - dwelling adults (n = 200), aged >70 years	RCT	Falls rate Blood pressure Fear of falling	Tai Chi reduced the risk of multiple falls by 47.5% Lower Blood Pressure in Tai Chi group before and after 12 minute walk Fear of falling responses were reduced after Tai Chi	
Wadell et al. 2005 Sweden	Investigate effects of decreased training frequency in patients with COPD	High intensity training program 3 times a week for 3 months and once a week for 6 months	43 (30 intervention, 13 control) COPD patients	Controlled trial – no mention of randomisation	Baseline, 3-month and 9 months -walking tests -cycle ergometer tests -St George's Respiratory Questionnaire -SF-36 -spirometry -bone mineral density.	Training once a week not enough to maintain improvements from initial high frequency training.	Low frequency training for 6 months with a preceding 3-month period of high frequency training might prevent decline in physical capacity and health related quality of life.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Fatouros et al. 2005 Greece	To determine the effect of intensity on strength, anaerobic power and mobility of older men	24 week high or low intensity strength training, 48 week detraining	52 older men (mean 71.2 +/- 4.1 years)	RCT	Baseline, post training and 4, 8 and 12 months follow-up upper and lower body strength anaerobic power timed up and go walking, climbing stairs.	High intensity produced greater gains in strength, anaerobic power and mobility, maintained through detraining. Anaerobic power returned to baseline after 4 months in both groups.	Small sample size. No adherence figures given. The sample were very motivated (attended 4 baseline preparation sessions).
Singh et al. 2005 Australia	To test whether: PRT is an effective antidepressant in older adults with clinical depression; high intensity PRT is superior to low intensity PRT and standard GP care	8 week PRT 3 times per week	Older community dwelling people (60) aged > 60 years with major or minor depression (DSM-IV psychiatric, assessment, GDS > = 14	RCT	Baseline, 8 weeks Depression score Outcome expectation Eysenck personality questionnaire Social support network Self efficacy Locus of control SF-36 Pittsburgh Sleep quality Index Muscle strength (1 RM).	Significantly more of high intensity group had a 50% reduction in symptoms (61% vs. 29% low intensity and 21% GP care, p = 0.03). All reported significantly improved sleep quality. Vitality quality of life improved more in high intensity group.	High intensity PRT is more effective than low intensity PRT or usual care in reducing depressive symptomatology in older depressed people.

Study	Aim	Intervention	Sample	Design	Outcome measures	Main findings	Strengths/ weaknesses
Tessier et al. 2000 Canada	To examine the impact of an aerobic exercise program on metabolic control, physical performance, QoL and attitudes in elderly ambulant patients with type 2 diabetes	Supervised rapid walking, strength and endurance program, 3 times a week for 16 weeks	39 people aged 65 or over being treated for type 2 diabetes	RCT	Glucose tolerance test, Quality of life Attitudes towards type 2 diabetes.	Intervention group had significantly improved area under curve for glucose tolerance, extended treadmill exercising, improved attitudes towards type 2 diabetes.	Exercise can be helpful for older people with type 2 diabetes where other treatments do not manage the condition.
Wilbur et al. 2003 US	To assess the effectiveness of a home based moderate intensity walking intervention in sedentary African American and Caucasian middle aged women	24 week home based moderate intensity walking intervention with behaviour strategies to promote adherence	153 sedentary employed women recruited via 9 worksites, newspaper and TV advertising. Mean age 49.8 years. 33% African American.	One year cross over trial with controls doing intervention after 24 weeks	Baseline, 24 weeks and 1 year Aerobic fitness BP, Lipoproteins Depressive status.	Adherence significantly higher in Caucasians (71.5% vs. 56%, those with higher self efficacy and those with less previous exercise experience. Average 64% of expected walks during 24-48 week maintenance phase.	Mainly professional women. Volunteer sample. Low attrition rate 20%.

Table A5.3 Review articles for the promotion of physical activity to prevent or treat depression

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions
Brosse 2002 US Critical review To determine whether exercise is effective in treating depression in adults	No details given for general review. 12 English language papers of RCTs where participants met diagnostic criteria for depression/reported elevated depressive symptomatology and did not require a specific comorbid medical condition	Inconclusive evidence for <i>added</i> value of exercise in those receiving antidepressants, standard psychotherapy or psychiatric care. Overall benefit compared to no treatment or social contact alone. The longer the intervention, the greater the benefit. Methodological weaknesses limit findings	Need for focus on older people
Paluska and Schwenk 2000 US Critical Review To review the current literature in the effects, mechanisms and potential benefits of using physical activity as a component in the treatment of depression and anxiety	Medline and selected bibliographies. No dates recorded. All types of design included.	Increased aerobic or strength training exercise significantly reduces depressive symptoms for adults and older adults. Habitual physical activity has not been shown to prevent the onset of depression. Although the evidence base is smaller, gains similar to those from meditation and relaxation have been found for anxiety and panic disorder, with acute anxiety responding better to physical activity therapy.	Better understanding of the underlying mechanisms is required.

Table A5.4 Review articles for the promotion of physical activity in older people

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Adams and White 2003 UK Critical review To discern if there is evidence of an additional effect of transtheoretical model (TTM) based activity promotion interventions over non-staged interventions.	1982-2001, 26 papers. Controlled and uncontrolled trials.	In general, the variety of TTM based activity promotion interventions reviewed reported short term gains in stage of change and/or activity behaviour. Positive changes were only seen in 29% of the long term (> 6 months) studies.	The findings come from studies largely employing white, middle class females. The complete range of TTM stages were not always represented nor were outcomes attained for all. A stage change without concomitant effect on activity behaviour has limited value.	No specific focus on older adults.
Atienza 2001 US Integrative, commentary Summarise the research literature on home-based physical activity programs for middle-aged and older adults (ages 40+ years).	1979-2000 29 studies Randomised clinical trials – some with controls.	Home-based training effective for improving cardiorespiratory health, physical and overall functioning, muscle strength. Can be more effective than group-based training.	Home-based programs effective and perhaps more convenient for some groups.	Little information on review methodology
Boule et al. 2001 Canada Meta-analysis To systematically review the effect of exercise interventions on glycaemic control in adults with type 2 diabetes.	To December 2000 14 trials (11 RCT, 3 non-RCT).	Weighted mean postintervention HbA1c lower in exercise than control groups -0.66 , $p < 0.001$) No significant difference in postintervention body mass.	Exercise has benefits that are not influenced by exercise volume or intensity, nor by weight loss. Both aerobic and resistance training are effective.	Results generalize to middle aged people across many ethnic backgrounds. Need more evidence for older people.

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Conn et al. 2003 US Integrative Effectiveness of interventions to increase physical activity or aerobic exercise in older adults.	1960-2000 17 studies (42 retrieved) RCT English language.	Wide range of intervention types. Few used tailored, mediated or theory driven techniques.	Overall, physical activity increased significantly in response to the interventions. Amount of physical activity usually failed to reach the current guidelines Need to obtain more details on strategies to reach a wider audience, sex and ethnic differences, achieving greater increases in physical activity.	Common weaknesses: Small sample sizes, time limited, non-validated outcome measures.
Dugdill et al. 2005 UK (Dugdill, Graham et al. 2005) Review of development, impact and evaluation of UK exercise referral schemes.	Commentary review Participatory action research with two schemes (case/cohort design).	For 342 adults tracked for 1 year at 3 monthly intervals adherence was 35-45%, with older adults more likely to complete. Physiological changes of population health rather than clinical significance. Adherence greater in those referred by cardiac and practice nurses than by GPs.	Further evidence of benefits for some population groups. Need to engage younger adults. Need for evaluation designs that give better understand of the context surrounding the effectiveness of a scheme at an individual and systems level.	
Eakin 2001 Integrative, commentary Review interventions designed to increase physical activity in middle-aged and older adults initiated in health care settings.	1995-1999 Four studies No mention of design.	No short-term increase in short-term physical activity, one intervention achieved long term change.	Limited literature in the area, need for assessment of more intensive interventions.	No information on review methodology. No mention of search and inclusion methods. No mention of criteria used to assess validity of studies.

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
<p>Ellingson and Conn 2000 US Integrative commentary To review the empirical evidence that older people who exercise regularly have improved quality of life.</p>	<p>7 descriptive, 11 trials.</p>	<p>Largely positive findings: no negative findings.</p>	<p>Limited by</p> <ul style="list-style-type: none"> - tools used to measure quality of life - small sample sizes - lack of follow up - limited conceptual frameworks. 	<p>Need more common quality of life framework and tools to compare between studies. Too many studies used only indirect measures of QoL , or interventions where the proposed mechanism was not outlined.</p>
<p>Fiatrone Singh 2002 Australia US Commentary review To discuss non-pharmacological modulation of body composition through appropriate dietary intake and physical activity patterns.</p>	<p>No strategy outlined.</p>	<p>Discusses relationship of body composition to chronic disease, adipose tissue mass and distribution, muscle mass and quality, bone mass. Provides exercise and dietary recommendations for body composition.</p>	<p>Body composition changes can take a while to materialize. Studies need to use behaviour change measures as the proximal outcomes.</p>	
<p>Gregg et al 2000 USA Integrative, commentary To assess the relationship between physical activity and risk for falls and osteoporotic fractures among older adults.</p>	<p>1975-1998 Observational (case control and prospective cohort) studies and RCTs (12 papers, 5 studies).</p>	<p>Level III-2 and III-3 evidence for 20-30% risk reduction for hip fracture from physically active compared to sedentary people. No evidence that physical activity protective for other osteoporotic fracture types.</p>	<p>Observational studies equivocal. Small sample sizes and underpowered studies limit findings. Recommend for future studies:</p> <ul style="list-style-type: none"> - Greater specification of types and quantity of physical activity - Identify those who benefit most. 	

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Hillsdon 2005 UK Cochrane review To assess the effects of interventions for promoting physical activity in adults aged 16 years and older, not living in an institution.	1979-2001 17 studies All RCT.	Effect of interventions on self reported physical activity and cardio-respiratory fitness was positive and moderate (SMD 0.31, 95% CI 0.12-0.51 and 0.4, 95% CI 0.09-0.70 respectively). No age differential effects (above or below 75 years) reported (1 study). Interventions incorporating professional guidance and self direction, plus ongoing support had more consistent effect estimates.	Interventions can produce moderate short to mid-term increases in physical activity, at least in middle-aged adults (mean 52 years SD 12.1). Clinical and statistical heterogeneity, limited interpretation of results. Majority of studies stopped after 12 months: no clear information on long term effectiveness. No examination of effectiveness in minority groups. Need for more cost-effectiveness data, details of person delivering intervention, the underlying theory and the translation into routine practice.	Studies failed to examine interaction between baseline levels of physical activity and exposure to intervention. Weaknesses in: allocation concealment, describing randomisation methods, blinding of assessors to group membership.
Holland 2002 Integrative, commentary Reviews literature on influence of physiological aging processes on connective tissue, joint integrity, flexibility and physical function of older adults.	32 studies 19 cross-sectional studies, 13 trials (8 general exercise and 5 specific stretch programs).	Loss of flexibility occurs between young adulthood and middle to old age, although no causal relationship established. Age related changes in musculoskeletal tissue and increased incidence of joint pathology, negatively affect joint extensibility and stiffness. Decreased flexibility involved in etiology of physical impairments.	Research on improving flexibility using stretch protocols has produced encouraging results.	No information on review methodology.
Houde 2002 US Integrative, commentary To review the literature on physical activity and its	1990-August 2000 44 research articles Trials and observational studies.	No clear evidence regarding quantity or type of physical activity to recommend. Evidence that physical activity decreases mortality rates. Equivocal evidence for	For future studies recommend: Larger sample sizes Better controlling for confounder variables, e.g. dietary factors, medication, comorbidity Use of psychometrically tested, population group appropriate, physical	

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
relationship to cardiovascular risk factors and mortality in older adults in order to clarify the specific benefits and optimal level of physical activity for cardiovascular health in the older adult population.		physical activity impact on cardiovascular risk factors.	activity measurement instruments.	
Keysor and Jette 2001 US Systematic review.	1985-2000 , 2 databases 31 studies, 29 RCT, 2 quasi-experimental.	Positive effects for strength, balance, flexibility, aerobic capacity and walking outcomes. Few improvements where physical, social, emotional and/or overall disability assessed.	Exercise in older people improves physical function and health. The current evidence does not clearly support a reduction in disability risk arising from physical activity adoption.	Methodological and theoretical weaknesses in existing literature.
Koltyn 2002 US Summarizes results from studies that have examined whether improvements in pain occur after an exercise intervention in older adults.	1977-2000 17 research articles Experimental and quasi-experimental.	Most investigations show exercise-training programs appear to improve pain in community-dwelling older adults.	Further research needed to know optimal conditions for pain reduction, and underlying mechanisms of the pain-relieving effects of exercise. More research needed on older adults in care.	
Linnan 2001 US Reviews the present status of worksite-based physical activity programs.	Experimental, quasi-experimental and observational.	Worksite physical activity programs yield health behaviour changes. However, evaluation methodology used is flawed.	Attention needed on work-based physical activity for older workers. No generisability of positive findings from past studies as flawed methodology.	

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Morris et al 2004 Australia Systematic review to determine whether progressive resistance training reduces impairments, activity limitations and participation restrictions after stroke.	8 studies reviewed, experimental or quasi-experimental.	Improved muscle strength (d = 1.2-4.5). Improvements in walking and stair climbing (3/8 studies).	Muscle strength consistently improved; some improvements in function, but insufficient evidence for social participation.	
Rhodes et al. 1999 US Reviews factors at the individual level associated with regular exercise among older adults.	27 cross-sectional and 14 longitudinal studies Participants mean age 65 years or over Four databases searched Dates not given.	Poor health and perceptions of frailty are major barriers to exercise adoption and adherence Education and exercise history positively associated with regular exercise behaviour.	Social cognitive theory guides understanding factors that predict exercise adherence, but there are relatively few studies that have tested the associations. There can be gender differences on some factors e.g. self efficacy and differences between younger and older adults.	
Rydwik et al. 2004 Sweden Systematic review To describe the effect of physical training on physical activity performance in institutionalized elderly patients with multiple diagnoses.	1980-2002; original RCTs in peer reviewed journals (16).	Trials with samples of people aged 70+ years, with multiple diagnoses and institutionalised. Strong evidence for muscle strength and mobility benefits. Moderate evidence for range of motion gains Equivocal evidence for gait, balance, endurance and ADL.	Heterogeneity highlighted. Future research needs: <ul style="list-style-type: none"> - Larger samples - More focus on clinically relevant outcomes - Greater specification/definition of interventions and their outcomes. 	

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Seefeldt 2002 USA Commentary review To summarise the literature dealing with the determinants of and barriers to an active lifestyle in adults.	No search strategy or methodology included. Descriptive studies and evaluation of the effectiveness of interventions designed to promote active living. 246 references.	Invariable and modifiable influences on physical activity adoption and maintenance discussed. Socio-environmental factors systematically appear as determinants across ethnic groups. Social support common factor across cultures, generations and genders.	Methodological inconsistencies have produced equivocal findings. Successful programs are tailored to individual needs and incorporate personal control and social support. Recommend for future studies: - Greater specification/definition of interventions and their outcomes.	
Spiriduso and Cronin 2001 US Systematic review To determine if exercise operates in a dose-response fashion to influence wellbeing and to postpone dependency.	To X Search strategy outlined Cross sectional and longitudinal studies, RCTs.	Level III evidence indicates that older people who are physically active have higher levels of physical function and well being. Level II evidence is equivocal in supporting this premise. Where improvement in function and wellbeing reported, no evidence that intensity acted in a dose-response manner to produce these effects.	Interventions were not always well adhered to, in part due to their inappropriateness for participants. Outcome measures not always appropriate for participants.	
Taylor et al. 2004 International Meta-analysis To update the systematic review of the effects of exercise-based cardiac rehabilitation in patients with CHD and to address previous concerns regarding the applicability of the evidence to routine practice	To March 2003 48 trials (19 exercise only) 8940 patients	Reduced all cause mortality (OR 0.8, 95% CI 0.68-0.93), cardiac mortality (OR 0.74, 95% CI 0.61-0.96), total cholesterol (wmd -0.37 mmol/l, 95% CI - 0.63, -0.11), triglyceride wmd -0.23mmol/l, 95% CI -0.39, -0.07 mmol/l) and systolic blood pressure (wmd -3.2 mmHg, 95% CI - 5.4, -0.9 mmHg). Lower self report rates of smoking.	Improvements are still seen even in newer studies where broader range of patients, more on improved drug therapy. Benefits independent of diagnosis, type of rehabilitation, exercise intervention dose, length of follow-up, trial quality and publication date. No conclusions about quality of life. All groups report improvements and analyses hampered by variable measures used.	

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Taylor et al. 2004 International Narrative review To critically review evidence on the effects of sedentary behaviour on health, for an ageing society, and whether trends towards increasing sedentary behaviour can be reversed and at what economic cost.	Not stated.	Few older people participate in physical activity to a level that may benefit their health. Healthy ageing is accompanied by physiological changes that are exacerbated by illness. There is some evidence that these can be reversed by physical activity uptake. Exercise has a role in improving biopsychosocial aspects of health.	The UK needs national trend data for physical activity in older people. The influence of the social and physical environment on physical activity uptake requires further examination. Strategies to encourage adoption and maintenance of behaviour need further evaluation. Service delivery targets and multidisciplinary education will assist the support of physical activity uptake amongst older people.	
Van der Bij et al. 2002 Netherlands Systematic review To evaluate the effectiveness of physical activity interventions among older adults.	1985-August 2000 7 databases Search strategy listed 38 RCTs.	Health based interventions (9), group based (38) and educational (10) interventions can promote increased physical activity. Changes are small and short-term.	Home and group based programs have good participation rates (from 55- 100%). Participation appeared unrelated to type or frequency of physical activity. Behavioural reinforcement did not add to the improvements. Longer-term outcomes need to be explored, using appropriate measurement tools.	
Witham et al. 2003 UK To review the benefits of exercise training for older people with chronic heart failure.	Not given. 18 RCTs tabled.	Efficacy studies indicate that physiological improvements occur that impact on clinical symptoms and health status.	Most people with chronic heart failure are 70 years or over and studies have tended to include younger adults. More studies are needed with older adults with a range of disability and comorbidities. The long term effects of maintained training remain to be assessed.	

Table A5.5 Review articles for types of physical activity used to promote health in older people

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
Verhagen et al. 2004 Netherlands Systematic review To assess the effect of Tai Chi Chuan on fall prevention, balance and cardiorespiratory function in older people.	To 7/2001; 9 papers from 7 studies; Experimental design.	Focused on samples aged 50 years and over. 478/505 were healthy seniors 53-96 years. Programs largely modified Yang forms, of varying frequency and duration. One trial (FICSIT) found significant reduced risk of falls. Where reported, compliance rates high (80% or greater).	Benefits based largely on pre-post analyses. Limited evidence for Tai Chi in reducing falls and BP in older people.	Limited blinded assessment, no follow-up assessment.
Roddy et al. 2005 UK Systematic review and consensus process To produce evidence-based recommendations on exercise in the management of hip and knee OA to guide health care practitioners.	Guideline development group and literature search of reviews, trials and lower evidence literature.	Both strengthening and aerobic exercise can reduce pain and improve function and health status in those with knee OA (level 1B) but limited evidence for hip OA Group exercise and home exercise are equally effective (level 1A) Exercise programs that include advice and education can promote a positive lifestyle change with an increase in physical activity (level 1B) Adherence is a principal predictor of long-term outcome from exercise in those with knee or hip OA (level 1).	Number of contraindications is small (level 4 evidence) Based on the general literature, strategies to improve and maintain adherence should be adopted e.g. long-term monitoring/review and inclusion of spouse/family in exercise (only level 4 specifically for knee or hip OA) The current evidence does NOT support exercise effectiveness independent of the presence or severity of radiographic findings.	

Table A5.6 Review articles of benefits of physical activity for adults

Author, review type and aim	Studies reviewed – timeframe, numbers, design	Findings	Conclusions	
<p>Lee and Skerrett 2001 US Systematic review To assess the dose-response relationship between physical activity and all-cause mortality.</p>	<p>1966-7/2000; 44 level III studies. Excluded where only 2 physical activity levels or specific mortality rates examined.</p>	<p>34/44 papers provide evidence of a linear inverse dose-relationship. Five report a threshold effect (L shaped curve), 5 no significant association. Applicable to men and women, younger and older adults.</p>	<p>Adherence to guidelines will reduce risk of all-cause mortality by 20-30%.</p>	<p>10 studies give specific results for older adults (> 65 years).</p>
<p>McTiernan 2000 US Commentary To review data on the associations between BMI, physical activity and breast carcinoma risk across populations.</p>	<p>Methodology not stated.</p>	<p>Discusses possible physiological mechanisms for the influence of physical activity on breast cancer development. Similar association seen in Japanese and White US women. Sedentary behaviour is prevalent in CLDB groups and, with obesity, may be a key risk factor.</p>	<p>There is a need for more research, focusing on CLDB populations, not only from an epidemiological perspective, but to gain further information about sub-groups perceptions of physical activity and appropriate means to measure it across population groups.</p>	
<p>Eldar and Marincek 2000 Slovenia Commentary review To review the evidence for physical activity in elderly people who have identifiable neurological impairment.</p>	<p>Methodology not stated.</p>	<p>There is some level IV evidence for the amelioration of fatigue and functional improvement in those with multiple sclerosis and post-polio syndrome. There is level II and IV evidence for health improvements for stroke patients.</p>	<p>The existing evidence indicates that exercise does not have any adverse effects when used to manage neurological conditions. More robust studies that focus on the older population are needed.</p>	

<p>Sherrington et al 2004 Australia Reviews systematic reviews and RCTs which investigated the effect of physical activity / exercise on falls in older people.</p>	<p>Search strategy defined. Studies published between Jan 2001 and Feb 2004 were included. RCTs were included if they were not included in the identified systematic reviews, and had more than 100 participants. Studies excluded if they didn't have falls as an outcome, non-English papers, and those focusing primarily on bone health. Identified 6 systematic reviews and 3 additional RCTs meeting inclusion criteria.</p>	<p>Strong evidence of effectiveness of individualized home exercise programs prescribed by trained health professionals (Level I). Level II evidence that group exercise programs, including tai chi, are effective in reducing falls. There is emerging evidence that individual prescription of physical activity is of greater value for frailer older people.</p>	<p>Considerable growth in recent randomized trial research and reviews. Some methodological difficulties encountered, including inconsistent definitions of falls, differing populations used, and differences in type, intensity and dosage of physical activity programs. Also a number of successful falls prevention studies have included physical activity as part of a multi-factorial program, and while the program may have been successful in reducing falls, the individual contribution of the physical activity program to the observed effect is often unable to be delineated.</p>	
<p>Taylor 1998 US Systematic review To evaluate physical activity interventions in low income and ethnic minority groups and people with disability.</p>	<p>1983-1997 papers focused on healthy adults. 14 studies identified. Mainly level II-2 or III-3 design.</p>	<p>Ethnic minority group interventions commonly used community advisory panels, community needs assessments and community members delivering intervention. Mostly process articles: two reported increased physical activity. The four disabilities papers reported changes to physical activity behaviour.</p>	<p>More work is needed to test the effectiveness of processes before program outcomes can be assessed. Increased use of theoretically driven approaches and the use of validated tools will be useful.</p>	<p>Specifically excluded studies focused on older people. However, the findings about disability may be generalisable to this group.</p>

Appendix 6 Recommendations derived from previous physical activity guidelines

Table A6.1 Recommendations for physical activity for older people derived from previous physical activity guidelines

Rec No	Recommendation	Number of reviewed guideline (see Table 7.1)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	General															
G1	Physical activity is not just for older adults in the young-old age range, who live independently. OR People of all ages, both male and female, benefit from regular physical activity (Surgeon Generals report)						✓				✓ p9	✓ p4				
G2	There are four main types of exercise that help older adults gain health benefits: 1. endurance / fitness; 2. strength / resistance; 3. balance; and 4. flexibility (and various combinations of these).						✓ p 5	✓			✓ p9		✓ p2			
G3	There are some generic and some specific health benefits associated with each type of exercise for older people, and these vary between exercise type.										✓ p10					
G4	When starting a physical activity program, start at a level that is easily manageable, and gradually build up the amount, type or frequency.						✓ p 3				✓ p10	✓ p5				
G5	"Too old" and "too frail" are not of themselves reasons to prohibit physical activity for older people. In fact, there are relatively few health reasons to stop older adults from becoming more active. ALTERNATE WORDING: There are relatively few older people who are unable to undertake a physical activity program, even those with a range of co-morbidities.										✓ p15					✓
G6	Older people become sick or disabled more often from not undertaking physical activity, than from participating in a physical activity.										✓ p17					
G7	Physical activity can improve health outcomes for some chronic conditions (eg stroke, arthritis), so long as it is done when the condition is under control (ie not in a flare up / acute condition).					✓ p 30	✓ p 4				✓ p15	✓ p 22				
G8	Men aged over 40, or women aged over 50 should check with										✓	✓				

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	their doctor first if planning to commence a vigorous form of physical activity (ie – if it causes deep breathing and sweating).										p16	p 23				
G9	Older people who are under a medical specialist's care should check with their specialist / surgeon / or other medical practitioner before commencing any new physical activity (eg people with abdominal aortic aneurysm, or critical aortic stenosis), people with symptomatic CVD, diabetes or other chronic health problem.							✓ p5			✓ p16 - 17	✓ p 6 & 23				
G10	If an older person is able to sustain participation in a new physical activity program for a month and keep going after that, it s a good sign that progress is being made towards establishing a sustained change in physical activity behaviour.										✓ p22					
G11	If an older person stops an established physical activity routine for several weeks, and then recommences the routine, they should start out at about half the effort they were doing prior to the break in the routine, then gradually build the routine back to its previous level.										✓ p27					
G12	Older people with risk factors, and / or stable medical conditions can benefit from low intensity or light forms of physical activity							✓ p6								
G13	A pre-activity evaluation is not necessary in most cases of people with stable (cardiovascular) disease who plan to undertake low to moderate physical activity. Where there is uncertainty of the safety of a new physical activity program, or for those wanting to undertake vigorous physical activity, medical review and (if required) medical investigations are recommended.														✓ p 12	
G14	Older people who have been inactive for some time should check with a doctor before commencing a new form of physical activity.						✓							✓ p 10		
G15	Undertaking 30 minutes of physical activity of moderate intensity on most if not all days of the week is sufficient to achieve health benefits for older people.					✓ p 3						✓ p 6	✓ p2			

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
G16	Higher levels of regular physical activity by older people are associated with lower mortality and morbidity rates.					✓ p 5						✓ p7				
G17	Many of the benefits of physical activity diminish within several weeks if the physical activity is substantially reduced, and effects can disappear in 2-8 months if it is not resumed.											✓ p7				
G18	Regular physical activity can improve aspects of mental health such as depression, anxiety, mood, and improve quality of life.											✓ p8		✓ p2		✓
G19	Information about the health benefits of physical activity for older people, including those with comorbidities, should be widely available.		✓ p 93			✓ p 7			✓ p6							
G20	Intermittent feedback about changes in health status can help sustain involvement in physical activity (eg GP blood pressure review, gym instructor remeasures 1RM)								✓ p7							
G21	Establishment of short and longer term goals of a physical activity program can help increase long term sustainability of participation.											✓ p8				
G22	Involvement of family and friends in a physical activity program can help increase long term sustainability of involvement in a physical activity program.											✓ p7				
G23	Opportunities should be sought to ensure consideration of healthy nutrition when an older person is involved in a physical activity program.				✓ p 33	✓ p9										
G24	Physical activity should be considered as a health promotion approach for well older people, as well as an avenue to improve health outcomes when comorbidities are present.		✓ p 94													
G25	Longer term health benefits require sustained engagement in physical activity over time.													✓ p2		

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Strength / resistance training															
S1	Strength training physical activities increase muscle strength and body metabolism (helping to keep weight and blood sugar within normal range) and may also help prevent osteoporosis.						✓				✓ p9					
S1A	With increasing muscle strength, increased levels of spontaneous activity have been seen in both healthy, free-living older subjects and very old and frail men and women. Strength training, in addition to its positive effects on insulin action, bone density, energy metabolism, and functional status, is also an important way to increase levels of physical activity in older people.															✓
S2	Strength training physical activities should include exercises for all of the major muscle groups at least twice weekly to achieve health benefits.						✓				✓ p32					
S3	When commencing a strength training physical activity, commence with a minimum of weight in the first week, and gradually over time add extra weight, to the point where performing the required amount is perceived as challenging.										✓ p32					
S4	When lifting weights, take 3 seconds to lift or push a weight into place, hold the position for 1 second, and another 3 seconds to lower the weight.										✓ p33					
S5	Each strength training physical activity routine should conclude with a gentle muscle stretching (flexibility) program.										✓ p33					
S6	No components of a strength related physical activity routine should cause pain. If pain is experienced, the routine should be ceased, and discussed with a medical practitioner.							✓ p 11			✓ p33					
C7 or S7	In order to optimise health benefits, cardiorespiratory endurance activity should be supplemented by strengthening physical activity at least twice weekly.											✓ p6				

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	<i>Balance training / postural control</i>															
B1	Physical activities with a focus on balance training can improve balance abilities, and reduce falls in older people, including those with high risk of falling.										✓ p9					
B2	A broad-based exercise program that includes balance training, resistive exercise, walking, and weight transfer should be included as part of a multifaceted intervention to reduce the risk of falling.															✓
B3	Exercises such as walking, aerobic dance, and stretching, which have been shown to increase joint range of motion, should be included in a general exercise program for the older adult. It appears likely that many different approaches, with even short program duration, may have a beneficial effect on flexibility. The exact dose-response relationship remains to be determined, as does an understanding of the benefits in the activities of daily life that accrue from increased flexibility.															✓
	<i>Cardio-respiratory / fitness training</i>															
C1	Cardio-respiratory based physical activity can result in a range of health benefits, including improved functional capacity, improved functioning of the heart muscle, improved glucose tolerance, lowered blood pressure, and increased muscle mass and reduced fat mass.						✓ p 6	✓ p4				✓ p 7				✓
C2	Start cardio-respiratory physical activity programs slowly at a low level, and gradually progress to achieve increase in breathing and heart rate. Use a minimum of 10 minute chunks to make up 30 minutes / day on most days (once you have built up).						✓ p 6				✓ p29					
C3	Incorporating a warm up and cool down / muscle stretching (flexibility) period before and after a cardio-respiratory physical activity program will minimise risk of injury or muscle soreness. (applies also to strengthening programs).										✓ p29					

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C4	Using appropriate safety and protection equipment (eg well supported running shoes for walking; helmet for bicycle riding) will minimise risk of injury.										✓ p29					
C5	When progressing a cardio-respiratory physical activity, build up the time of the physical activity first, and then build up the difficulty of the physical activity.										✓ p29					
C6	To achieve optimal health benefits from cardio-respiratory forms of physical activity, they should be undertaken 4-7 days each week						✓ p 6									
	<i>Flexibility / stretching programs</i>															
F1	Flexibility or stretching exercises should be undertaken at the end of strengthening or cardio-respiratory physical activity routines.										✓ p45					
F2	Flexibility or stretching exercises can reduce the risk of injuries from physical activity participation.						✓									
	<i>Incidental physical activity</i>															
I1	Significant health benefits can be obtained by including a moderate amount of incidental physical activity (up to 30 minutes accumulated throughout the day) on most if not all days of the week.											✓ p 4				
	<i>Condition specific recommendations</i>															
	<i>Cardiovascular disease (recommendations taken directly from the National Heart Foundation of Australia's guidelines).</i>															
CS1	Doctors and clinicians should routinely provide brief, appropriate, written physical activity advice to people with well compensated, clinically stable cardiovascular disease (CVD).														✓ p4	

Rec No	Recommendation	Number of reviewed guideline (see Table 7.1)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CS2	Survivors of a recent cardiovascular event should be offered participation in supervised [#] exercise rehabilitation where available and practical.														✓ p4	
CS3	Well compensated, clinically stable people with CVD including those with implantable cardiac devices, and congenital and valvular heart disease, should progress their physical activity over time to the recommended dose (30 minutes or more of moderate physical activity on most, if not all days of the week. The amount of activity can be accumulated in short bouts).														✓ p4	
CS4	People with advanced CVD or severely impaired functional capacity may have to down-regulate the recommended dose of physical activity.														✓ p4	
CS5	People who have recently had surgery, or angioplasty +/- stenting for CVD should take into consideration the implications of the surgery / procedure when commencing physical activity.														✓ p4	
CS6	Unless contraindicated, all people with peripheral vascular disease (PVD) or diabetes and survivors of stroke with sufficient residual function should progress over time to the recommended dose of physical activity (see CS3).														✓ p4	
CS7	Regular low to moderate exercise is safe in older people with well compensated clinically stable heart failure.														P 17	
CS8	Older people with CVD can be encouraged to do low to moderate intensity physical activity, with multiple shorter bouts daily. As they progress, the duration of bouts can increase.														P 18	
CS9	The only consistent beneficial CV response to light- to moderate-intensity exercise training in older adults is a reduction in blood pressure in older hypertensive adults.															✓
CS10	Moderate or high-intensity exercise may be required to elicit adaptations in the cardiovascular system and in cardiovascular disease risk factors. However, the initiation and maintenance of long-term light- to moderate-intensity physical activity programs in older adults may reduce the rate of age-associated deterioration in numerous physiological functions, even if they do															✓

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	not result in absolute increases in these measures, which, in the long-run, should benefit both quantity and quality of life.															
CS11	Regular physical activity can reduce the risk of Type II diabetes (across all ages).				✓ p 53											
CS12	In adults, the risk of Type II diabetes declines as frequency of exercise increases to 3-5 times per week.				✓ p 53											
CS13	Older adults with osteo-arthritis pain should undertake a prescribed physical activity / exercise program to derive similar shorter term and longer term physical, psychological and functional benefits as observed in the general population.									✓ p 810						
CS14	Physical activity should be an integral component of the management plan for older adults with osteo-arthritis.									✓ p 810						
CS15	Appropriate, regular physical activity that accommodates the specific needs and circumstances of the individual older person with osteo-arthritis does not exacerbate osteo-arthritic joint symptoms or accelerate the pathological process of osteo-arthritis.									✓ p 810						
	<i>Frail older people</i>															
FO1	All exercise programs for frail older people should include progressive resistance training of the major muscle groups of the upper and lower extremities and trunk.															✓
FO2	Balance training should be incorporated into physical activity programs for frail older people, either as part of strength training or as a separate modality.															✓

Rec No	Recommendation	Number of reviewed guideline (see Table 7.1)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FO3	Training and supervision is mandatory for safety and progression to occur.															✓
F)4	Although walking is a preferred mode because of its direct functional nature, in some individuals only arm and leg ergometry, seated stepping machines, and water exercises may be possible for a variety of disabilities, and these are suitable alternatives if available.															✓
FO5	By eliminating unnecessary barriers to optimal mobility and fitness among the oldest adults, substantial health benefits may be realized via both prevention of new disabilities as well as rehabilitation from chronic conditions.															✓
FO6	Support should be provided to facilitate access and involvement of older people with disabilities in appropriate physical activity programs.					✓ p7								✓ p7		
FO7	Most geriatric syndromes associated with frailty are responsive to increased levels of appropriate physical activity.															✓
	<i>Other recommendations for physical activity for older people not derived from reviewed guidelines</i>															
O1	The selection of the most appropriate form of physical activity for older people is determined by personal preference, and the most appropriate physical activity to address identified health problems.															
O2	Most types of physical activity are able to be graded from a very low level through to high level, providing a basis for tailoring of a physical activity to an individual person's needs.															
	<i>Providers of physical activity programs for older people / policy and planning</i>															
P1	A variety of physical activity options should be accessible,			✓												

		Number of reviewed guideline (see Table 7.1)														
Rec No	Recommendation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	equitable and available at reasonable cost for older people			p 91												
P2	Physical activity programs for older people should be conducted by appropriate experience and training (see International guidelines on training, JAPA).													✓ p 10		
P3	Environments (parks, paths, shopping centres) should be supportive of physical activity for older people. This includes issues of surfaces (paths, curbs and stairs, shops and shopping centre floors), lighting, seating, and safety.		✓ p 93	✓ p 93		✓ p8										
P4	Provision of options or choice in the types of physical activity available for an individual can increase uptake and sustained participation in physical activity.								✓ p6							
P5	Arbitrary chronological age cut-offs should be eliminated in research and exercise programs. Exclusions should be based on participants' functional abilities.															
P6	An inter-sectoral approach is essential to the development of environments supportive of physical activity in the community.		✓ p 65/ 100			✓ p7								✓ p8		
P7	Research needs to be supported to address the gaps in evidence in effective physical activity options for older people, and effective translation of new research findings undertaken to maximise uptake and sustained engagement of older people in physical activity.		✓ p 93													

Appendix 7 Resources

For consumers

Australian Government Department of Health and Ageing (2005) *An active way to better health: National physical activity guidelines for adults (brochure)*. Canberra.

Australian Government Department of Veteran's Affairs & Department of Health and Ageing (2005) *Choose Health: Be Active* Canberra: Commonwealth of Australia and the Repatriation Commission.

National Institute of Aging (2001) *Exercise: a guideline from the National Institute of Aging* Sep Report No. NIH 01-4258. Bethesda, MD: National Institutes of Health.

For professionals

American College of Sports Medicine (2000) *ACSM's guidelines for exercise testing and prescription* Baltimore: Williams & Wilkins.

American College of Sports Medicine (2000) *ACSM's resource manual for guidelines for exercise testing and prescription* Baltimore: Williams & Wilkins.

American College of Sports Medicine (2002) *ACSM fitness book* Champaign, IL: Human Kinetics.

American Council on Exercise (1998) *Exercise for older adults* Champaign, IL: Human Kinetics.

Australian Government Department of Veteran's Affairs & Department of Health and Ageing (2005) *Choose Health: Be Active* Canberra: Commonwealth of Australia and the Repatriation Commission.

Best- Martini, E, Botenhagen-DiGenova, KA. (2003) *Exercise for frail elders* Champaign, IL: Human Kinetics.

U.S. Department of Health and Human Services (2002) *Physical Activity Evaluation Handbook*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Appendix 8 Strategic priority areas from the Blueprint document

Intersectoral strategies

- Specify what interventions are most beneficial for segments of the 50 plus populations (active older adults, frail elderly, homebound, disabled, etc.).
- Create a national clearinghouse to disseminate effective, tested public education, social marketing materials, and public policy information on physical activity and aging.
- Evaluate current programs and devise systems to share and replicate effective programs.
- Seek opportunities for nonprofit associations and agencies to work collaboratively with the for-profit sector to develop joint public education programs. Involve groups including public health, health care organizations, community groups, faith institutions, schools, hospitals, and health clubs.
- Establish and disseminate standards for fitness leaders who work with mid-life and older populations.
- Conduct quantitative and qualitative research on effective social marketing strategies in communicating information about physical activity and older adults.
- Provide more information on how to segment and communicate effectively to the age 50 and older audiences.
- Develop and test a mass-market communications campaign to increase awareness about the importance of physical activity in the health of age 50 and older Americans. Include messages related to what needs to happen to make opportunities for physical activity more accessible.
- Conduct market research to better understand how to leverage the social aspects and benefits of physical activity as a way to communicate and encourage people to be more active.
- Conduct market research on specific communications initiatives.
- Personalize messages to target audiences, using market research and audience appropriate communication delivery systems.
- Identify and use “ambassadors” and celebrities to communicate to the 50 plus audiences.
- Test the effectiveness and impact of emerging communications technologies including use of the Internet

Research strategies

- Conduct studies to characterize seniors who are currently active. These studies will include constructing a profile of this group (or groups) — who they are, what they do, what got them started, what sustains them, how they have overcome barriers. This profile could be useful in informing the work for individual and community based interventions, as well as broad public health interventions.
- Design and implement a comprehensive longitudinal study of activity-friendly communities to track their impact on reducing disease and disability, as well as improvements in people’s quality of life.
- Conduct behavioral research to understand better what motivates individuals to participate in community, home-based, and work site programs or self-directed activities.
- Explore how to establish, maintain, and reinforce regular physical activity behaviors across multi-levels of intervention, e.g. personal, interpersonal, organizational, and environmental.
- Identify barriers to walking for adults age 50 and older, determine why these barriers exist, and develop specific recommendations for how to overcome and avoid them.

- Identify appropriate valid and reliable measures of physical activity and other health outcomes that can be used in future physical activity research targeting mid-life and older adults, which will increase the internal validity of studies and confidence in efforts to determine the effectiveness of home-based, community-based, and work site-based programs. These efforts will also increase the ability to compare findings from different studies and to better develop and disseminate best-practice guidelines and recommendations for creating effective programs.
- Conduct research and disseminate findings to inform health program developers, social marketers and health care professionals to understand what interventions or factors influence the physical activity of age 50 and older adults. These factors or determinants might include significant life events such as the death of a spouse or a move to a retirement community, etc.
- Conduct research to understand better the elements of effective work site programs that focus on mid-life and older workers. Disseminate findings and best-practice guidelines.
- Evaluate the cost benefit of increased physical activity within assisted living facilities.
- Conduct research related to HCFA/Medicare guidelines for physical activity and the older population.

Home and community strategies

- Highlight examples of activity-friendly communities and home/community-based programs, including a system to share best practices. Identify what programs exist, what works, and what evaluation mechanisms are in place.
- Develop and test appropriate programs for living arrangements, such as assisted living communities or naturally occurring retirement communities.
- Educate people about physical activity and have physical activity professionals such as trainers and fitness instructors work with older people to teach and reinforce skills.
- Encourage more health, physical education, recreation, and dance professionals to become certified/trained in working with older adults.
- Identify professionals in the community who can serve as resources for information and assistance. Work as much as possible with existing community groups such as the YM/YWCA, community centers, senior centers, health and sports clubs, schools, places of worship, and hospital wellness programs, etc.
- Provide funding and implement physical activity programs for older adults through existing appropriate community facilities such as YM/YWCA, community centers, senior centers, places of worship, etc.
- Identify and assess existing group physical activity programs that can be translated into self-directed programs. Share information related to best practices.
- Provide community organizations with a template for good physical activity programs: Outline the elements of a good program including facilitator qualifications, monitoring, evaluation, and sustainability issues. Identify "best practice" physical activity programs for adults age 50 and older that can be replicated and generalized.

- Design and implement a health-impact assessment that is similar to an environmental impact assessment for communities.
- Establish partnerships among health, aging, urban/community planning, transportation, environmental groups, recreation, social service, and the private sector. Encourage these groups to work together to define, create, promote, and sustain communities that support lifelong physical activity.

Workplace strategies

- Seek employee input in the planning and development of programs targeted to the age 50 and older worker.
- Create a workplace environment where time for physical activity is incorporated into daily activities.
- Design a system that provides employers with tax incentives based on physical activity programs/opportunities they afford their employees.
- Provide financial incentives to employers that incorporate physical activity enhancements in their corporate setting land-use plans.
- Provide health insurance cost reductions to employers that offer physical activity programs to employees.
- Develop, implement, and evaluate model work site physical activity programs, targeted to employees age 50 and older.
- Provide tools and templates to enable employers to communicate information about the importance of physical activity.
- Identify and disseminate information about successful work site physical activity programs designed for employees age 50 and older.
- Communicate to business leaders the benefits of physical activity for older workers, especially as they pertain to desired outcomes of management (e.g. cost-savings, employee absenteeism)

Medical systems strategies

- Assist health care systems in establishing methods to gather information on current practices related to physical activity assessment, counseling, and follow-up with mid-life and older patients.
- Incorporate “best practices” on physical activity into education programs for all health care professionals.
- Develop an evidence-based approach and practice guidelines to deliver physical activity programs and information through health care settings. Provide professionals with education on how to implement such initiatives. Implementation might include the approach of *Ask, Advise, Assess, Assist and Adjust*.
- Increase health care professional training on physical activity in older populations. Such training should be available through medical and health care professional schools and through continuing education programs for physicians, sports medicine professionals, occupational and physical therapists, nurses, and health educators.

- Encourage medical students and medical professionals (physicians, nurses and other allied health professionals) to be more physically active in order to serve as role models for patients.
- Enlist experts working in health care systems to help identify effective components of physical activity programs for people age 50 and older.
- Identify community resources, (i.e. YM/YWCAs, certified trainers, fitness clubs, etc.) which are quality sources for information related to physical activity and the age 50 and older adult and provide this information to consumers via medical settings.
- Increase coordination and develop partnerships between medical professionals and the community to facilitate referrals and information sharing. Provide health and medical professionals with information and resources about physical activity opportunities for the older population so that they can make referrals and recommendations as appropriate.
- Assist patients in identifying physical activity options that match their interests, lifestyles, and functional abilities; and identify opportunities for them to pursue these.
- Establish and share with health care professionals minimum standards for physical activity among older adults in terms of endurance, strength, flexibility, and balance.
- Develop standards to accommodate physical activity programs in nursing care/ assisted care facilities that focus on reacquisition of mobility after illness or injury as well as maintenance of regular physical activity.
- Develop materials, guidelines, and toolkits to enable health care providers to more effectively communicate with patients the benefits of physical activity.
- Disseminate information about physical activity in the age 50 and older persons to health professionals via professional journals, professional societies, meetings, and related media.
- Establish and evaluate health and wellness programs in health care settings that rely on trained allied health professionals rather than physicians to provide patients with physical activity assessments and counseling.
- Demonstrate the cost effectiveness of these strategies to managed care organizations and health insurance companies

Policy/advocacy strategies

- Develop committed coalitions/partnerships to build leadership and capacity, leverage resources, and provide an ongoing forum for organizations to share information and ideas that can be implemented in a variety of settings.
- Engage constituents in advocacy activities.
- Organize older adults to become more directly involved in making their neighborhoods and communities more walkable.
- Involve health care professionals, clergy, and business leaders in advocating for activity-friendly communities.
- Involve professional organizations/associations in advocating for activity-friendly communities.

- Channel tools and funds to communities so that they can implement actions designed to increase physical activity among mid-life and older adults.
- Provide incentives to states and communities that achieve measurable increases in the physical activity levels of the 50 and older population.
- Provide funding to low-income populations and publicly funded community organizations and programs to make physical activity opportunities more readily available and accessible for age 50 and older adults.
- Identify barriers to increasing local and state funding to create activity-friendly communities and to assure easy access to physical activity programs for all persons age 50 and older.
- Provide community organizations with help in developing long-term, sustainable funding for physical activity programs, training, and resources for the age 50 and older population.
- Educate policymakers about the importance of physical activity for the age 50 and older population, emphasizing the social, economic, and health benefits. Include information that provides examples of effective policy in this arena.
- Conduct a policy analysis of health plans that offer benefits related to physical activity for mid-life and older adults.
- Develop, implement, evaluate, and disseminate a model policy for quality of care related to physical activity for older adults.
- Design and test a program to provide people with reductions in health insurance costs based on physical activity levels.
- Advocate for funding for program and policy analysis research on physical activity and the age 50 and older population. Advocate for increases in funding to disseminate research findings and translate practice guidelines into practice.
- Support the development of safe activity-friendly communities.
- Provide information on the cost effectiveness of increasing regular physical activity among the age 50 and older population to help support public policy, program, and reimbursement efforts.
- Develop a national scorecard to outline what makes a community activity-friendly for older adults and publicize rankings.