

HALE AND HEARTY — THE BENEFITS OF EXERCISE IN THE ELDERLY

The role of physiotherapists, biokineticists and exercise scientists in maximising function and independence in the elderly.



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Health-enhancing, anti-ageing medical strategies which place emphasis on minimising the onset of disease are emerging as an important approach in the care of the older adult.

Now, more than ever before, there is an opportunity to consider the role of medical and allied health professionals in maintaining the health status of the older adult. With the remarkable increase in longevity it is expected that many more adults will attain life spans well over the biblical projections of 'three score years and ten'. The anticipated maximum lifespan projection of 125 years for homo sapiens seems attainable.¹ Advances in medicine and health promotion contribute to longevity. These have resulted in an understanding of the risks associated with advancing age which in turn has inspired a deliberate therapeutic effort to add 'life to years' and not only 'years to life'. Augmenting the quality of life during old age is central to holistic care of the elderly.²

Therapies designed to augment the quality of life of the elderly are a collective effort. Geriatricians, physiotherapists, occupational therapists, nutritionists, psychologists, podiatrists, sociologists, biokineticists and exercise scientists all have an important role to play. The role of each person within the multidisciplinary care team for the older adult is full of opportunity. This article places particular emphasis on the role of the physiotherapist, biokineticist and exercise scientist with regard to health protection, health enhancement, functional assessment and promotion of an independent life. To illustrate these possibilities, the prevention and treatment of falls and the value of exercise therapy for mobility risk reduction are discussed. This approach improves functional status, delays the onset and manifestation of chronic diseases and specifically increases the exercise or physical activity dose for the elderly client.

As background it is necessary to:

- consider the importance of this approach with regard to demographic indicators
- challenge the mindset of professionals with regard to the treatment potential of the elderly
- highlight the psychosocial influences that affect the health of the elderly
- examine and then challenge age-associated characteristics of ageing

- value the importance of exercise therapy and physical activity programmes
- emphasise the importance of multi-disciplinary assessment and the special needs of the elderly before appropriate interventions are applied.

DEMOGRAPHY AS AN INDICATOR OF OPPORTUNITY

The South African population is estimated at 42.13 million. In 1998, over 2.42 million South Africans were 65 years and older, comprising approximately 5.9% of the total population. Of this group a relatively large proportion (2%), mainly women, were older than 75 years.³

Currently, a small percentage of this population resides in nursing homes. However, because of recent legislation, only 2% of the older population will be able to access and reside in state-supported institutional facilities. Consequently, even those with significant socio-economic limitations and a disability (absence of two or more independent life-sustaining functions as determined by activities of daily living (ADL) requiring long-term care now have to reside in the community. Demographic indicators suggest that this number will increase substantially in the next 25 years. By implication, there is both an opportunity and obligation for professionals to address the challenge of delivering health enhancement services designed to sustain independent life.

By comparison, in the USA 35 million people (13% of the population) are 65 years and older and, while some remain in reasonably good health as they advance in years, the following statistics are sobering:

- 88% of Americans over 65 have at least one chronic health condition and 21% of people 65 and older have a chronic disability⁴
- 50% of women aged 70 - 80 have difficulty with general mobility like walking a street block, climbing a flight of stairs or doing general housework⁵

- 25% of persons over 50 who suffer a hip fracture die within a year of the incident.⁶

In many cases access to early assessment and physical activity could have had a positive impact on reducing the incidence or management of these compromising conditions.

MYTHS AND STEREOTYPES: CHANGING THE MINDSET

There are many misconceptions about ageing. Central to these is the 'expected' age-associated dysfunction leading progressively to infirmity. Although the chronological criterion for 'old' age has been arbitrarily defined as the population older than 65 years, a noticeable variation in health and functional well-being has resulted in the recognition of 3 groups of older persons: the young-old (65 - 74 years), old-old (75 - 84) and oldest-old (85+ years).⁷ Notwithstanding these convenient age groups it is important to recognise the heterogeneity of ageing and particularly to recognise that a distinction exists between chronological and biological ageing. Chronological age is the passing of time since birth, whereas biological ageing, the more accurate marker of age,⁸ takes into account each person's multiple functional abilities. Older people have as great a variability in their habits, life experiences, diseases and disabilities as do people in other life periods.⁹

Regrettably, old people are often incorrectly portrayed as senile, frail, eccentric and dependent. Despite pathophysiological changes, most elderly individuals remain mentally alert, functionally independent, self-sufficient and safely mobile.¹⁰ It is heartening to note that 70% of the elderly in the USA are independent community dwellers.¹¹ The uniqueness (heterogeneity), robustness and resilience of the elderly are often unexpected and under-emphasised. Therefore, prejudices are created as ignorance prevails.

PSYCHOSOCIAL FACTORS AFFECTING THE ELDERLY AS A GROUP

Marginalisation of the elderly, referred to as ageism, can be compared to the prejudices of racism and sexism. In Western society, as market forces empower younger adults, the older adult has been progressively demoted. These attitudes result in the elderly internalising these values and cause poor self-esteem, which in turn diminishes interest in living out their potential. Health care professionals should take this into consideration when working with the elderly. Creative techniques that apply all manner of ways to augment the quality of life, affirm the ability of the individual and encourage the belief that it is possible to live a full, purposeful and healthy life, are necessary.

In most non-Western societies the older adult is revered. As a result of urbanisation and industrialisation traditional family values break down. Under these circumstances the elderly no longer enjoy the same respect or hold traditional positions as head of the family group. In South African rural areas groups of impoverished elderly men and women are found with poor health and social status. Furthermore, and although this view is unresearched, young South Africans appear to be financially, physically and emotionally ill-prepared for the challenge of independent survival in old age.

EXPECTED AGE-ASSOCIATED BIOLOGICAL CHANGES

Longitudinal studies have demonstrated that the cardiovascular, musculoskeletal, metabolic and central nervous systems all show some functional diminution with age. Hearing, vision, renal function, glucose tolerance, systolic blood pressure, bone density, pulmonary function, immune function and sympathetic nervous system activity have all been shown to diminish functionally.¹² In addition, muscle strength, motor response time, co-ordination and nerve conduction speed show a gradual decrease with age.¹⁰

Over-medication or 'polypharmacy' is a well-known contributing factor to falling.

It is well known that doctors have a strong influence over the elderly person's concept of health.

Exercise prescriptions for the older, previously sedentary adult should ideally be delivered by those trained in the field.

Aerobic work capacity can be variably reduced owing to a decrease in the lowered maximum attainable heart rate, decreased myocardial contractility and reduced maximum oxygen consumption. A notable cardiovascular change with age is a reduced baroreceptor sensitivity that may contribute to orthostatic hypotension.¹⁰

Changes in metabolic functions contribute to osteopenia, decreased bone density, altered glucose tolerance, decreased basal metabolic rate and impaired thermal regulation. Reduced hepatic and renal functions may slow the metabolism and clearance of many drugs.^{10,12}

The age-related changes in the central nervous system (CNS) are fairly modest and include decreased speed of brain processing during the performance of verbal or manual skills, which is often associated with mild memory loss.¹⁰

While some biological change is inevitable, it is important to understand that these changes are not synonymous with disease or chronological age. However, the older adult who is habitually more sedentary is also more susceptible to disease exacerbated by an inactive lifestyle.²

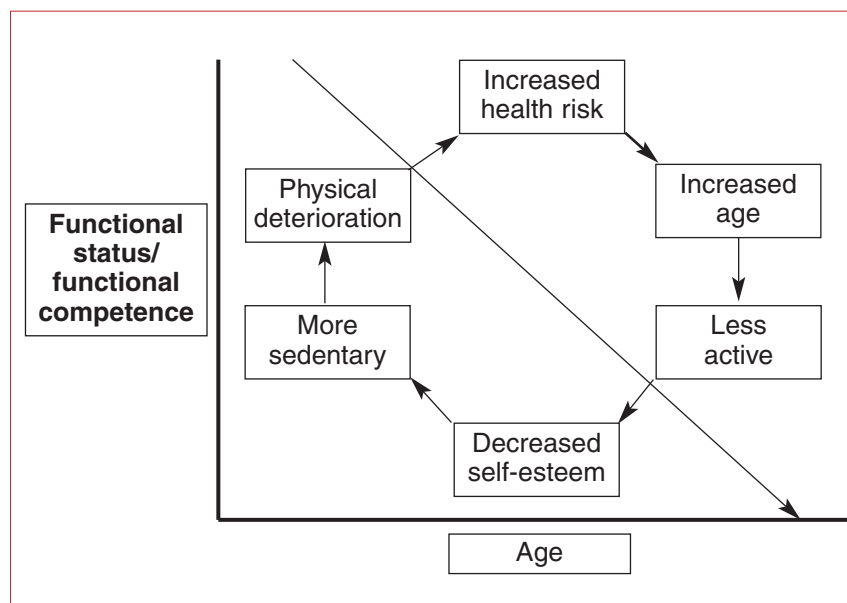


Fig. 1. The hypokinetic cycle of physical inactivity.¹⁵

EXERCISE AS TREATMENT

Various health problems in the elderly are not necessarily a consequence of ageing. Poor health and early mortality can be attributed to physical inactivity and lack of sufficient and appropriate physical activity or exercise interventions.¹³ In the USA the physical activity profile of the ageing population looks alarmingly bleak: approximately 34% of the population of 50 and older are sedentary, with two-thirds of all adults over the age of 65 either irregularly active or completely sedentary.¹⁴ Worse still, the prevalence of inactivity among black American women 75 years and older is 61% (for black males of the same age it is 59%), while in their white counterparts inactivity prevalence is 47% for females and 37% for men. Although there are no South African data to compare with these findings, the disparities in inactivity among different gender and racial/ethnic groups send us clear signals.

Unfortunately, physical inactivity appears to be the norm for older adults. Intervening in the 'typical' age-related hypokinetic cycle of physical inactivity, illustrated in Fig. 1, seems prudent.

Immobility accelerates the ageing process of the musculoskeletal system, resulting in loss of muscle and bone mass, weakness and joint contractures, as well as a decrease in cardiovascular fitness. Immobilisation may also affect the psychological status of the patient, which in turn impairs perception and influences the possibility of affective changes such as an increase in feelings of anxiety, fear and depression. A decline in aerobic activities, with concomitant loss of muscle strength and flexibility, interferes with the older person's ability to perform activities of daily living such as housework and shopping. This results in premature loss of independence.

Nowadays there is strong evidence for exercise promotion as a means of improving the quality of life for all ages. However, compliance and adherence to habitual exercise remain a problem. Because of physiological reserve, if a young person does not follow a regular exercise regimen it will not adversely affect his/her life. However, this does not apply to the elderly as lack of exercise could have a detrimental effect on their function and health. Despite the potential benefits of exercise, there is overwhelming evidence that clients 'drop out' or fail to comply with the recommendations

made. Compliance rates have been estimated to range from 50% to 80% during the first 6 months and to fall to less than 50% after the first year in studies of persons younger than 50 years.¹⁶ Lee *et al.*¹⁷ however suggest that older adults may be more compliant to exercise prescriptions because they have greater concern for their health and more time available to exercise than their younger counterparts.

The trend today is for health professionals to encourage active lifestyles, especially for the elderly. Regular participation in physical activity programmes has been associated with a variety of benefits in health for older adults, not least of which are improvements in cardiovascular, respiratory and muscular function as well concomitant reduction in disease risk factors. Martin and Sinden¹⁸ point out that a targeted exercise prescription offers benefit that cannot be achieved with any other therapeutic modality. An active lifestyle improves function into old age. However, the benefits of a planned exercise programme with specific goals positively affect certain aspects of the biology of ageing, mainly the musculoskeletal, cardiovascular and nervous systems.¹⁹ There are contraindications to exercise (Table I) that the physiotherapist, biokineticist and/or exercise scientist must consider when planning and prescribing

appropriate exercise programmes.

Exercise therapy for the elderly should be specific, risk free, pain free, enjoyable, accessible, well monitored and well organised. The therapist should remember that the present cohort of elderly people were raised with the belief that exercise is dangerous for the elderly²¹ and are therefore more resistant to being compliant to exercise.

The benefits of exercise are well documented. Convincing data from the Harvard Alumni studies showed that adults who expended over 2 000 kcal/week during exercise, had mortality rates one-third the rate of sedentary individuals of the same age.²² However, most habitually inactive elderly would not initially be able to achieve this exercise target. Instead, the initial focus of an exercise programme for the elderly should include exercises that are designed to improve balance, movement, speed, co-ordination, agility, strength, range of joint movement and then endurance-type exercises.^{14,23}

HEALTH BENEFITS OF REGULAR PARTICIPATION IN PHYSICAL ACTIVITY

A strong body of scientific evidence exists showing that physical activity

can contribute to improved health and function as well as protect against chronic illness and disability. These benefits are summarised in Table II.

With this overwhelming evidence, health care providers should be encouraged to promote participation in regular, special needs physical activity and be aware that the gains augment the quality of life of older people, even in the face of pathology or physical limitations. This is particularly important when counteracting the detrimental effects of bed rest and inactivity during long illness and hospitalisation.

MOBILITY RISK AND PHYSICAL FRAILTY AS PRECURSORS TO FALLING

Physical frailty is defined as reduced physiological reserve associated with increased susceptibility to disability. This can be attributed in part to a decline in physical activity.¹⁴ A fall is an important cause of death and disability in the elderly. One-third of elderly persons living at home suffer a fall each year.^{9,12} The factors that contribute to physical frailty and the incidence of falls are:¹⁰

- postural instability due to poor vision
- impaired vestibular function
- decreased proprioception

Table I. **Absolute contraindications to exercise in the elderly² and relative risk indicators associated with medical conditions²**

Absolute contraindications	Relative risk conditions requiring special exercise prescriptions and safety considerations
<ul style="list-style-type: none"> • Acute coronary heart disease • Decompensated congestive cardiac failure • Uncontrolled ventricular arrhythmias • Severe valvular disease, including aortic, pulmonary and mitral stenosis • Uncontrolled systemic hypertension • Pulmonary hypertension • Acute myocarditis or infectious illness • Recent pulmonary or deep vein thrombosis 	<ul style="list-style-type: none"> • Chronic obstructive pulmonary disease (COPD) • Coronary artery disease (CAD), hypertension and cerebrovascular accident (stroke) • Diabetes (type II) • Arthritis and joint pain, hip fracture and or knee replacement • Osteoporosis • Alzheimer's disease and related dementia disorders • Sensory losses, cognitive and depressive conditions • Progressive neurological disorders: Parkinson's disease, multiple sclerosis

Table II. Overview of influences of regular physical activity on health-related fitness components

Health-related component	Influence of regular exercise
Physical component	<ul style="list-style-type: none"> • Favours energy balance • Reduces upper-body fat and visceral fat percentage • Maintains or increases bone density • Slows decline of bone mineral density • Increases lean mass
Muscular component	<ul style="list-style-type: none"> • Reduces risk of fractures • Improves muscle strength • Improves muscle endurance • Reduces risk of musculoskeletal disability
Motor component	<ul style="list-style-type: none"> • Improves balance • Improves strength and flexibility • Improves co-ordination • Reduces risk of falls • Increases mobility • Increases reaction time
Cardiovascular and respiratory component	<ul style="list-style-type: none"> • Improves myocardial performance • Increases peak diastolic filling • Increases heart muscle contractility • Reduces premature ventricular contractions • Improves blood lipid profile • Increases aerobic capacity • Improves heart and lung functions • Reduces systolic blood pressure • Improves diastolic blood pressure • Sustains cerebral perfusion • Improves endurance
Metabolic component	<ul style="list-style-type: none"> • Decreases blood triglycerides • Reduces low-density lipoproteins • Increases blood HDL-cholesterol • Increases lipid oxidation • Improves insulin sensitivity of tissues • Favours balance between lipid uptake and lipid oxidation
Behavioural component	<ul style="list-style-type: none"> • Improves cognition • Improves interest in sexual activity • Improves sleep • Increases speed of movement and decision making • Improves perceived well-being and happiness • Improves levels of serotonin, catecholamine and norepinephrine • Improves internal locus of control

Adapted from: Bouchard²⁴ and the National Blueprint for increasing physical activity among older adults age 50 and older.²⁵

- decreased muscular strength
- decreased precision in muscle control resulting in gait disturbances
- musculoskeletal conditions such as a kyphoscoliosis due to osteoporosis and painful joints, clinically detected as altered posture and gait
- impaired balance
- lack of confidence.

The effect of even one fall may lead to dramatic behavioural changes, clinically known as post-fall syndrome, often manifested in a behaviour recognised as fallopobia²⁶ or fear of falling. Even if the fall does not produce an injury, a vicious cycle (Fig. 2) follows resulting in voluntary choices to avoid activity in the 6 months after a fall.²⁷

If the post-fall syndrome is the 6th highest cause of death in the elderly in the USA, then the role of the therapist in postoperative care of hip fracture after a fall is well known.¹⁰ However, the role of the physiotherapist, biokineticist and exercise scientist in the prevention and management of post-fall syndrome is not well recognised. In addition, the effect of exercise ther-

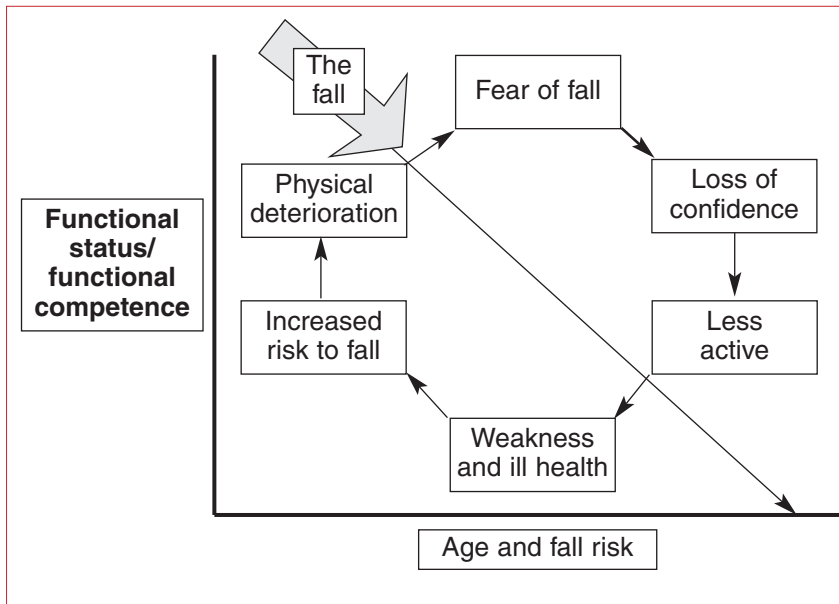


Fig. 2. Fall prevention and post-fall therapy: Vicious cycle of emotional, physical and health deterioration as a result of a fall.

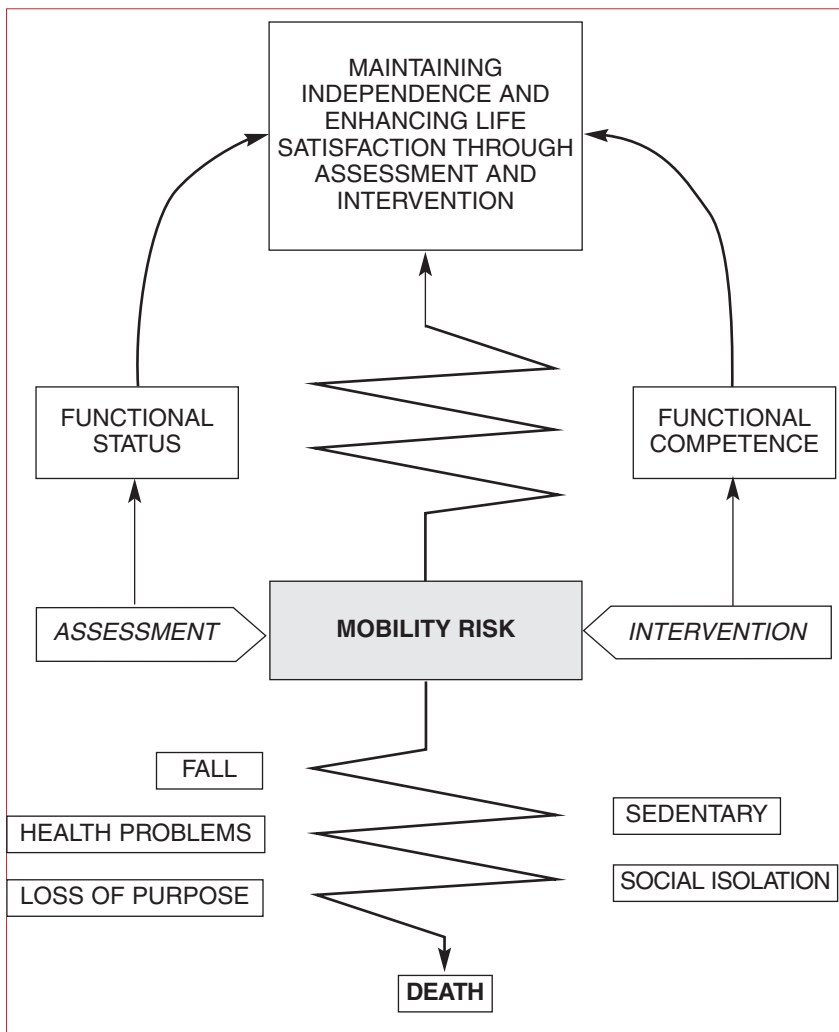


Fig. 3. The model of opposing forces around the pivotal construct, 'mobility risk' which highlights the critical point therapists need to assess in order to avoid fall episodes and through appropriate intervention maintain the trajectory of successful ageing.²⁸

apy is underestimated or ignored. What is indicated is thorough mobility risk assessment²⁸ to identify persons at risk of falling as well as those with medical conditions which predispose to falls and, based on the assessments made, to develop appropriate fall-protecting interventions (Fig. 3).

The fall may be an atypical presentation of certain medical conditions, such as pneumonia, arrhythmia, myocardial infarct, arthritis and depression. All elderly persons at risk of falling should be referred to a specialist therapist conversant with the prescription of exercise.

The treatment of falls can be divided into the following:

- **Cognitive training.** It is important to educate the patient on the cause, result and prevention of future falls. Once elderly persons are aware that this is a condition that can be treated, their confidence improves. The elderly person should be taught how to re-orientate and where possible regain a stable posture safely as well as how to establish contact with family or friends in the event of another fall. From our clinical experience this is the most important aspect of prevention and treatment.

- **Environmental adaptation.** A home visit to assess the living environment is essential to prevent falls.¹⁰ Advice can be given on adapting environmental factors. Examples include improved lighting in all areas, removal of loose and thick carpets, avoidance of slippery surfaces and the removal of obstacles from walking paths. A light source within easy reach must be available at night.

In conjunction with the occupational therapist various adaptations to areas in the home can be made, such as ensuring that all chairs are secure and sturdy, installing handrails in the bathroom, toilet and shower, lowering shelves and placing utensils within easy reach in the kitchen. At the same time

care should be taken to advise the elderly on wearing appropriate footwear, including low broad-heeled shoes and secure shoe closures.²⁷

- **Exercise therapy.** An assessment of functional capacity as well as mobility risk should be carried out. Exercise programmes should be prescribed based on these data and should include:
 - muscle strengthening
 - balance retraining and co-ordination
 - postural training
 - gait training including walking on level surfaces, inclines and ascending and descending stairs.¹⁰

The exercise therapy for the prevention of falls and as a rehabilitative prescription after a fall should initially focus on improvements in lower limb function and confidence building during locomotor (gait and dynamic balance) activities. Thereafter, the exercise dose should include activities which progressively result in health protection for the cardiovascular and respiratory systems.

- **Use of assistive devices.** The physiotherapist should advise the client on the use of assistive gait aids such as a cane, quadropod or walker with or without wheels. Training sessions in the use of these aids are necessary. Without learning these skills the older adult often refuses to ambulate.
- **Education on the effect of polypharmacy.** The therapist should know the side-effects of various medications. Over-medication or 'polypharmacy' is a well-known contributing factor to falling. Discussion with the attending doctor is encouraged.

EMPOWERED AND FREE

The importance of educating different groups in the community including the caregiver, the elderly, their families, the retiree, the middle-aged adult as well as all other health care professionals is often underestimated.

It is well known that doctors have a strong influence over the elderly person's concept of health. As a result, all doctors need to be empathetic with regard to the benefits of exercise therapy, especially those related to improving function as well as preventing and treating falls. They should also discuss the detrimental effects of polypharmacy on certain functions such as balance.

Exercise prescriptions for the older, previously sedentary adult should ideally be delivered by those trained in the field.

CONCLUSION

We have reviewed the role of the physiotherapist, biokineticist and exercise scientist in the health and functional enhancement of the elderly. We have emphasised that well trained professionals are needed to promote the value of exercise therapy as well as encourage regular participation and sufficient doses of physical activity. The physiotherapist's medical background and the exercise scientist's movement analysis background make them ideally suited to develop, monitor and administer these exercise programmes for groups and exercise prescriptions for individuals. A holistic approach is stressed, encouraging participation of physiotherapists, biokineticists and exercise scientists in a multidisciplinary team where the roles of the different members may overlap.

We believe that this review encourages physiotherapists, biokineticists exercise scientists and doctors to explore this opportunity further and together find ways to add quality to the lives of elderly clients. Working together could help individuals and communities reverse age-associated risks and avoid or delay the progress of a disabling process.

Acknowledgement

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References available on request.

IN A NUTSHELL

The health care professional in the care of the older adult is often associated with the treatment of diseases in the elderly.

An equally important role is that played in enhancing the functional status and quality of life of the older adult.

This role is examined with regard to exercise therapy, prevention and treatment of falls and in the education of the elderly.

Physiotherapists, biokineticists and exercise scientists are encouraged to participate in multidisciplinary health care teams.

Together they should recognise the significant opportunity to advance 'successful aging' by prescribing exercise to delay the onset of infirmity and to compress morbidity.