Evaluation of knowledge translation and workforce development through targeted exercise for falls prevention education programs for exercise physiologists

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Abstract

There is a wealth of evidence supporting the positive effects of exercise for falls prevention. The problem that faces researchers, policy makers, accreditation bodies and higher education providers is how to best translate this information to allied health practitioners to ensure they are providing the best evidence-based practice to their clients. One in three community dwelling older people over the age of 65 years fall every year and this figure increases to one in two people over the age of 80 years. As a profession, exercise physiologists (EPs) are responsible for providing exercise for the prevention, maintenance and treatment of chronic disease and complex medical conditions, including prescribing exercise for falls prevention. The incidence of falls, chronic disease and complex medical conditions increases with age and as Australia moves towards an ever ageing population, the cost burden of health care for older people and falls is exploding.

Exercise physiology and exercise science professionals have an opportunity to become champions of exercise for falls prevention and assist in ameliorating the ever increasing burden of falls in Australia. By targeting the exercise physiology profession and providing methods to translate the research evidence, there is great potential to build workforce capacity to deliver falls prevention exercise programs. But how best to target the profession of exercise physiology? Advances can be made by targeting undergraduate and post-graduate university programs or as part of mandated professional continuing education programs which focuses on both the future and current exercise physiology workforce respectively.

A scoping study conducted across two States in Australia (New South Wales and Victoria) established that at the time, the current level of knowledge of undergraduate human movement and exercise and sports science students and post graduate exercise rehabilitation/exercise physiology students, was inadequate with regard to falls risk and exercise prescription for fall prevention in older people. These results highlighted the need for

the development and widespread implementation of an evidence-based “exercise for falls prevention” curriculum for future exercise professionals.

The UniFPEP curriculum was developed to provide evidence-based teaching and learning resource materials to enhance learning beyond current levels by translating the latest research evidence regarding falls risk and exercises for falls prevention to produce a discipline leading curriculum. The curriculum was designed to enhance exercise science and exercise rehabilitation students’ learning outcomes through the provision of online lectures and learning materials to supplement and strengthen the delivery of face-to-face lectures, practical classes and self-directed learning tasks.

The UniFPEP curriculum was implemented at the University of Ballarat and following completion students’ knowledge outcomes and self-reported confidence to prescribe exercise for older people and for falls prevention were significantly increased. The results indicated that a significant change in knowledge and confidence can be achieved during a 2-3 week educational period during a normal university semester. More importantly, these changes were retained 13 weeks after completion of the UniFPEP curriculum.

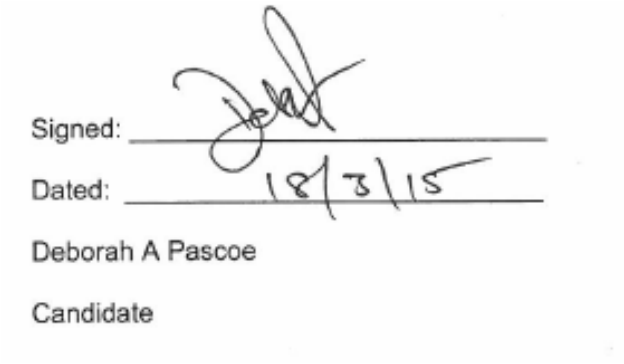
Following evaluation of the UniFPEP the curriculum was reviewed and prepared as a workforce continuing education program (CEP) (Fit+Fall=Free). This was implemented and evaluated as a clustered controlled trial to compare two different delivery modes: face-to-face and online, to a control group of exercise physiology professionals. The Fit+Fall=Free CEP showed significant improvements in the knowledge and confidence of EPs in prescribing exercise for older people and exercise prescription for falls prevention for both the face-to-face (F2F) and Online delivery modes. The F2F delivery of the Fit+Fall=Free CEP provided the greatest long-term impact with the increases being maintained at a significant level six months post workshop.

The potential for knowledge translation and impact on preventing of falls in older people can be achieved by targeting both university students (UniFPEP) and accredited exercise physiologists from the current workforce (Fit+Fall=Free). Targeting both of these groups results in significantly increased in knowledge and increased confidence levels following participation in a targeted education program.

The results of this PhD support the translation of knowledge through targeted evidence-based education programs for both university students and the current professional workforce. Significant knowledge gains and increases in confidence can be achieved by delivering the programs either online or face-to-face. Based on the results of this research, both the higher education sector and providers of professional education programs have the opportunity and responsibility to provide evidence-based curricula which will inform, enhance and advance the future and current allied health workforce in exercise prescription for falls prevention.

Statement of Authorship

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and bibliography of this thesis.



Preface

The major components of this thesis have been written as a compilation of (stand-alone) papers arranged in chapters (Chapters 2, 3, 5, 6, 7, 8 and 9). For each of these chapters some of the introduction and methods of these papers are similar. Components of discussion may therefore be similar also.

To improve the readability the introductions of chapters 5, 6, 7 and 8 contain portions of the same theoretical background to allow each chapter to maintain the outline of an independent paper.

Changes of names have occurred for some of the organisations mentioned in this PhD and therefore some of the accompanying documentation (ethics, plain language information statements, consent forms etc.) in appendices have the former organisational name:

ESSA – Exercise and Sport Science Australia formerly AAESS – Australian Association of Exercise and Sports Science.

Federation University Australia formerly the University of Ballarat.

Terms and Abbreviations

CEP	Continuing education program
CCT	Clustered controlled trial
EP	Exercise physiologist
ESSA	Exercise and Sport Science Australia
Fit+Fall=Free	Workforce-based falls prevention continuing education program
UniFPEP	University falls prevention education program

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Thank you Tia for just being my wonderful little 'Squirt' who makes me smile and brings me joy when it is sometimes hard to find.
Jen and Tia, my sincere love and gratitude to you both. Thank you for supporting me on this journey. You both deserve a PhD for your support.

Dedication

To **Mum**

Sorry you didn’t get one more opportunity to brag.

Publications and Conference Proceedings

Pascoe DA, Sturnieks DL, Close, JCT, Tiedemann A, Lord SR, Twomey D, & Finch CF. (2013). Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP). *Focus on Health Professional Education, 15*(2):55-66.

Pascoe DA, Finch CF, & Donaldson A. Evaluation of continuing education programs (CEPs) for allied health professionals. *ANZAHPE 2011 LOCAL? GLOBAL? Health professional education for social accountability*. Alice Springs, Northern Territory, Australia 27 June - 30 June 2011.

Sturnieks DL, Finch CF, Close JCT, Tiedemann A, Lord SR, & **Pascoe DA.** (2010). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. *Journal of Science and Medicine in Sport, Australia, 13*(1):59-64.

Sturnieks DL, Finch CF, **Pascoe DA**, Close J, Tiedemann A, & Lord SR. (2008). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. Australia and New Zealand Falls Prevention Conference: Melbourne October.

Pascoe DA, Sturnieks DL, Finch CF, Close, JCT, Tiedemann A, Lord SR, & Twomey D. (2008). Knowledge outcomes of a university-based professional falls prevention education program. Australia and New Zealand Falls Prevention Conference: Melbourne October.

Awarded Best Paper

Pascoe DA, Finch CF, Sturnieks DL, Lord SR, Close JCT, Tiedemann A, & Twomey D. (2009). Knowledge outcomes and retention of a university based falls prevention education program. *9th National Conference. Injury Prevention & Safety Promotion.* Melbourne. July.

Pascoe DA & Finch CF. Delivery and evaluation of a continuing education program for exercise practitioners in falls prevention and exercise prescription for older people. (Poster) ESSA/SDA 2010: Science & Nutrition in Exercise & Sport 'From Research to Practice' Conference. Gold Coast 9-11 April 2010.

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Chapter 1
Introduction

Conceptual framework

The conceptual framework for this PhD combines three established frameworks from the areas of knowledge translation, capacity building and adult education. The three frameworks have been used to develop and provide a pathway to investigate workforce development, through professional education to provide possible solutions to the burgeoning health crisis of falls in older people. By focusing on the widespread problem of falls in older people and targeting the allied health profession of exercise physiology within Australia, this study provides a new approach to building health care capacity, while meeting the needs of allied health professionals through the provision of evidence-based continuing education programs.

The problem of falls in older people

Older people frequently fall. Tinetti[1] defined a fall as “a sudden, unintentional change in position causing an individual to land at a lower level, on an object, the floor or the ground, other than as a consequence of sudden onset paralysis, epileptic seizure or overwhelming external force” (p.1007). One in three people living in the community aged over 65 years will experience at least one fall each year[1] with over 30% suffering injuries requiring medical attention.[2] The fall rate increases to one in two, for people over the age of 80 years.[1,3] Due to their frequency, falls are a significant health problem among the elderly and are a major cause of injury and death in older people.[4] Approximately one in 40 of those aged over 65 will be hospitalised following a fall and of those admitted to hospital one in two will be alive a year

later.[5] With such high rates of falls for community dwelling people aged over 65 years, the associated consequences of falling, such as decreased mobility, reduced quality of life and increased risk of falling, can be devastating.[6] As a result, falls in the elderly is currently recognised as one of the top priorities in public health care worldwide.[7]

Globally, a substantial proportion of falls in community dwelling older people result in hospitalisation[8,9] and many of these falls increase the likelihood of admission to residential care.[4] In Australia, for the period 2003-04 falls occurring in the home and health care facilities accounted for 94.4% of falls which resulted in hospitalisation.[10] The number of hospitalisations due to falls and fall injury for people aged over 65 years in Australia in 2003-04 was estimated at 60,497.[10] Two thirds of those hospitalised sustained at least one fracture with most people sustaining a single fracture per fall. Women sustain a higher percentage of fractures (70.0%) than men (58.2%)[10] but the rate of fall incidents involving one or more fractures increases markedly with age for both genders.

The Australia Institute of Health and Welfare report leaves no doubt that hospitalisations due to falls and other fall-related conditions constitute a substantial proportion of the burden of disease and health expenditure for people aged over 65 years.[10] With the most common types of falls causing hospitalisation being a fall on the same level due to slipping, tripping or stumbling (34.3%) the underlying cause of falls, related environmental factors and/or personal characteristics which lead to a falls incident need to be addressed.

The research evidence demonstrating the extent of falls for both community dwelling older adults and those in aged care facilities is overwhelming and a number of research-based prevention measures have been trialled, however, widespread reduction in the rate of falls for older people is yet to be achieved. Tinetti[11] noted that between 1970 and 1986 there were only two publications listed on the MEDLINE database that were related to “accidental falls” and “aged”, however in the years from 1986 to 2000 there was 1,767. A recent search using the

same search terms on the U.S. National Library of Medicine database shows a marked escalation in the number of research publications over the last 40 years with only 17 publications being noted between 1965 and 1985, 4,494 publications from 1986 to 2005 and a further 5,890 publications from 2006 to 2014.[12] Falls, falls risk, and the prevention of falls are undoubtedly areas of focus for researchers, health organisations and Governments worldwide. Such concerted research efforts have identified consistent findings which have universal application and merit. However, one of the major driving forces for health care organisations worldwide is the escalating health care costs associated with falls in older people.[7,9,10]

The cost of falls

In Australia it is estimated that the number of people aged over 65 years will double by the year 2051.[13] With an ageing population it is predicted that the health care costs associated with falls and fall related injury will triple by 2051. Moller[13] reported that the total cost of hospital admissions due to fall injury in the over 65 population in Australia was $317.6 million for both public and private inpatient and out-patient care in 2001. The demand for health care services related to falls will require an additional three quarters of a million bed days per year and an estimated 3,320 nursing home places.[13] Hall and Hendrie[14] used a prospective study design and estimated the national cost of fall injury in older people to be $287 million, including emergency department presentations and the cost of care in the three months post-hospitalisation. However, the two studies by Hall and Hendrie[14] and Moller[13] used different methodologies to calculate costs and in acknowledging this, Bradley and Harrison[10] suggest that the 'lifetime' costs of falls in older people was, if anything, an underestimate. Given the predicted spiralling health care burden, falls in Australia must be viewed as a major economic and healthcare problem which will continue to escalate as the population continues to age toward 2051.

The associations between ageing, functional decline, falling and increased health care use is well described[15-18] and have been fundamental in determining whether falls should be targeted for prevention. The strongest argument has advocated that expanding resources for the prevention of falls will impart even greater resource savings through fewer hospitalisations, home care services, nursing home days and other health services.[19] In an effort to curb the rising costs of falls, falls prevention and identification of falls risk have received increasing attention and support in an endeavour to decrease the personal, health care and economic consequences of falls.

Considerable evidence now demonstrates that the most cost effective methods of reducing falls include falls risk assessment and targeted interventions such as exercise programs and environmental risk reduction.[5,20] The cost effectiveness of these strategies has received only limited attention in falls prevention research studies,[20,21] with a call for future research to follow guidelines which promotes comparability and consistency to allow economic evaluation of fall prevention strategies.[20,22]

Risk factors associated with falls

The problem of falls in older people is not just related to high incidence, as young children and athletes have a higher falls incidence rate than all age groups, except the most frail elderly.[5] Falls in older people may therefore be viewed as a combination of high incidence and high susceptibility, especially with the additional high prevalence of chronic disease and age-related physiological changes. The physiological and psychological changes in older people due to ageing can transform a relatively mild fall into a serious and perhaps life threatening event.[5] Age-related factors such as increasing physical frailty caused by advancing age and impaired ability to perform activities of daily living have been found to be strong risk factors for falls in community dwelling older people.[23]

Falls in older people which are attributed to trips, slips and stumbles may stem from the interaction between the ageing person and the environment.[1] Environmental hazards such as loose rugs, electrical cords, wet surfaces, and poor lighting are easily identifiable and easily remedied. However, the accumulated effects of age and disease which present as risk factors for falls in older people, although modifiable, also present health care workers with a much greater challenge to ameliorate. Older people have stiffer, less coordinated gaits, with postural control, body orienting reflexes, muscle strength and tone and stepping height all declining with age. These changes impair an older person's ability to avoid a fall following an unexpected trip, slip or stumble.[5]

Close and colleagues[23] concur that two of the strongest risk factor domains associated with falls are impaired balance and mobility and gait patterns. Many prospective studies[3,24-26] show that tests of leaning, reaching, stepping, and walking can delineate fallers from non-fallers. Impaired functioning of sensory and neuromuscular systems due to age, inactivity or disease processes are also strong risk factors for falls, with measures of vision, peripheral sensation, strength and reaction time also able to significantly and independently discriminate between fallers and non-fallers.[23]

The development of risk factors for falls, decreases an older person's ability to effectively engage a strategy to prevent a fall.[5] For example, maintaining balance through the stance phase of stepping is mitigated by slower reaction time and decreased mobility and strength of the lower limbs to effect the stepping action quickly enough to avoid falling. This highlights the need to correctly identify the risk factors which contribute to the cause(s) of a fall which in turn will ensure that the appropriate measures for prevention are then specifically targeted.

Screening for falls risk

To minimise falls in older people, falls risk assessment measures are used to identify both intrinsic (individual) and extrinsic (environment) risk factors which may contribute to or cause

a fall. Extrinsic factors which may contribute to an older person falling are predominantly related to the person/environment interface. Hazards such as unsafe shoes,[27,28] rugs or slippery surfaces may be reduced by home assessment and modification, education advice and installation of safety devices in the home (grab rails, non-slip mats).[29,30] However, these interventions have been found to have limited effectiveness in reducing falls in non-fallers but are not effective in older people with history of falls.[29,31] Once identified, environmental hazards are relatively easy to remedy,[30] but identifying and reducing intrinsic risk factors may provide more of a challenge to health care providers.

Intrinsic risk factors which may contribute to falls in older people include poor vision, decreased lower limb strength, decrease mobility, poor balance, impaired sensation and medication use. These intrinsic risk factors can be measured by a number of physiological tests and screening tools. Clinical assessments of balance used for screening for falls risk include the Tinetti balance test,[32] Berg Balance Scale[33] one legged (stork) stand[34] and the Clinical Test of Sensory Interaction in Balance[35] (CTSIB). Several performance measures such as tests of vision, strength (especially lower limb strength), balance, proprioception, and vestibular function can also be used to assess older peoples' falls risk as well as a number of simple tests of mobility, the 'timed up and go',[36] sit to stand, 6-minute walk test and the functional reach test.[37]

Research has found that tests of vision, sensation, strength, speed and balance can accurately predict older people who are at risk of falling.[26] Physiological testing can provide information about the causes of falls on an individual basis and provide information about potential intervention strategies.[38]

Interventions to reduce falls risk and prevent falls

Falls have serious consequences for older people and prevention programs have looked at a number of different single and multifactorial interventions across a number of different settings.

Single intervention strategies such as individual home based exercise[39,40] and group exercise to improve balance,[41] Tai Chi,[42] withdrawal of psychotropic medications[43] and cataract surgery[44] have all been found to decrease falls in older people living in the community.

Multifactorial approaches such as combined adjustments of medication, behavioural instruction and exercise,[19] group based exercise, home hazard management and vision improvement[45] and combination of a comprehensive geriatric assessment, a diagnostic home visit and home intervention with recommendations[46] have also been successful in reducing falls for older community dwelling people. For older people receiving inpatient or residential home care, falls prevention interventions which have a multifactorial approach[47,48] are more successful.

There is no single all-encompassing intervention for falls prevention, but the growing research evidence provides a clear direction for exercise interventions to be included across a variety of populations and settings.[44] Exercise in the form of strength and balance training is most effective and needs to be progressive and prescribed by a trained health professional.[49] When prescribing exercise as part of a falls prevention program, risk factors need to be clearly identified by the trained health professional in the same manner as screening an older person to participate in any exercise class. Screening for falls risk should form part of the normal risk stratification process associated with any health risk screening for individuals wanting to start an exercise program.[50]

Exercise and falls prevention

There is clear evidence that a targeted supervised home exercise program prescribed by a trained health professional can prevent falls among older community dwelling people.[49,51] Untargeted group exercise involving Tai Chi or other exercises which challenge balance are also effective for older people living in the community, but further research needs to be

conducted to establish the effect of these on falls for older people in residential care facilities.[49] The relative effects of different types and formats of physical activity and exercise programs also requires further investigation. Many older people with additional individual health risk factors such as poor functional ability due to reduced strength, mobility and balance would benefit from participation in general exercise and activity programs which are also likely to decrease the risk of falls.

The effects of exercise on falls prevention has been found to be enhanced with an increase in balance intensity. In a systematic review and meta-analysis,[49] it was found that high challenge balance training which involved standing and performing exercises applying at least two of three exercise prescription principles produced a larger reduction in falls. High intensity balance exercises need to include, movement of the centre of mass over the base of support; narrowing of the base of support; and/or, minimising upper limb support. Applying these three exercise prescription principles also allows the intensity of balance training to be prescribed and modified to meet individual progression needs. These findings lend support to earlier research which demonstrated that exercise programs which have been successful at reducing the number of falls in participants have demonstrated clear exercise progression, supervision and tailoring to individual needs.[39,52] Exercise programs which involve circuit training classes and the use of a weights facility can also enable more of a challenge to balance and increase the overall dose of exercise.[41] Other forms of exercise which challenge balance such as Tai Chi[53] and group exercise classes have also been found to be of benefit in reducing falls and falls risk.

The falls prevention research to date demonstrates that there is strong evidence for the prescription of strength and balance training and moderate evidence for weight bearing group exercise with balance exercises and Tai Chi.[44] Currently there is little evidence that fitness training, seated resistance training, walking, seated exercise and water exercise have a significant effect on reducing falls and falls risk.[44] Therefore the effectiveness of exercise

programs is maximised if interventions are targeted to at-risk groups, contain weight-bearing balance components which are progressive, and include exercises that are specific to activities of daily living for older people.

Cost effectiveness of exercise for falls prevention

Effective approaches to falls prevention include multidimensional risk factor assessment tied to targeted interventions, exercise programs and environmental assessment and modification.[5] The breadth of research within the area of exercise for falls prevention is vast and exercise has now been proven to be one of the most effective approaches to falls prevention.[44,49]

For over a decade research has demonstrated that prevention programs that include strength or balance training, or both have been shown to reduce falls.[15,19,39,53,54] However, intensive falls prevention programs are costly to develop, implement and evaluate even though the positive outcomes of these interventions result in fewer falls related injuries[39] fewer hospitalisations[55,56] and savings on health care costs.[15]

A 2010 systematic review[21] investigated the value for money of strategies to prevent falls in older adults living in the community. Studies reviewed included those which analysed cost-effectiveness, one cost-utility and one cost-benefit analysis. Of the nine studies included in the review, three effective falls prevention strategies were cost saving in a subgroup of participants: (1) an individually customised multifactorial program in those with four or more of the eight targeted fall risk factors, (2) the home-based Otago Exercise Program in people 80 years or older and (3) a home safety program in the subgroup with a previous fall. Best value for money came from effective single factor interventions such as the Otago Exercise Program[57] which was cost saving in adults 80 years and older. Although limited, the research[21,58] demonstrates that costs for delivery of a falls prevention exercise program can be decreased if the mode of delivery is specifically targeted to one of the above subgroups.

Falls prevention and accredited exercise physiologists

Research has shown that falls in older people can be predicted by poor performance in measures of balance, vision, reaction time, lower limb muscular strength and proprioception.[24] Research has also demonstrated that exercise has a major role to play in modifying key falls risk factors and preventing falls among older people.[49,57] There is now clear evidence that older people who participate in exercise programs, can improve their reaction time, walking speed, muscular strength,[59] and balance[60] and thereby reduce their falls risk.[44]

To be successful in reducing the number of falls for participants, exercise programs need to demonstrate clear exercise progression, supervision and tailoring.[39,52] Health professionals who have undertaken training in the area of falls prevention may be best placed to provide specifically targeted and supervised exercise interventions for falls prevention. Accredited exercise physiologists (EPs) in Australia are allied health professionals who specialise in clinical exercise interventions for people at high-risk of developing, or with existing chronic and complex medical conditions and injuries.[61] By targeting their skills and knowledge in exercise prescription, EPs have the potential to make a significant contribution to falls prevention in Australia by providing exercise programs tailored to prevent falls in at risk individuals and older people.

Considering that all ageing bears an increased risk of falling.[1] the need for specific exercise prescription targeting falls prevention should be incorporated into all types of exercise prescription for the elderly. Therefore all exercise programs provided by EPs for older people, whether for the control of type 2 diabetes, management of arthritis, or general health and well-being have the potential to also target falls prevention without compromising the major aims or focus of the exercise prescription. However, university courses and continuing education programs which prepare and educate EPs need to ensure that this potential falls prevention workforce is capable of meeting the expanding future needs of an ageing population.

At the commencement of this PhD work, it was not known if undergraduate exercise science and post-graduate exercise physiology students in Australia (i.e. future EPs) have the necessary knowledge and confidence to take a leading role in the provision of evidence-based exercise services for older adults, and more specifically, for falls prevention. It was also unknown whether the current EP workforce has the knowledge, skills and confidence to provide and prescribe exercise for falls prevention. However, like other similar allied health professionals, EPs are required to participate in continuing professional education programs to maintain their professional accreditation.[62] Therefore, undergraduate university-based programs and EP continuing education programs may provide an ongoing opportunity for the latest research in exercise and falls prevention to be translated into practice for the current EP workforce. Within the allied health field, EP's fulfil a key role within the health care and hospital sector (through inpatient and outpatient programs) and the broader community, to provide primary and secondary prevention programs for chronic and complex medical conditions which could easily be modified to target falls prevention.

The statement of the problem

Falls prevention is an important focus for governments, policy makers, researchers, allied health professionals, general practitioners and the individuals affected by falls.[63-65] The EP profession has the potential to become champions of exercise prescription for falls prevention and by doing so lead a nationwide attack on falls, falls risk and fall related injuries. However, to realise this potential within the EP profession a number of workforce development strategies are required.

As with other areas of the health sector, to build capacity within the EP profession, workforce development needs to take place,[66] beginning now and continuing into the future. For workforce development to occur, planned educational strategies are required to meet the varied needs of students undertaking undergraduate and post-graduate programs and

professional development[67] of the current EP workforce. To ensure quality learning outcomes across the university sector and current workforce, university-based and professional continuing education programs must deliver appropriately planned curricula based on sound adult learning principles. The curricula content must ideally translate the latest research into effective learning and teaching outcomes to provide adult learners with evidence-based falls risk assessments and provide sound strategies for exercise prescription for falls prevention. A focus on effective knowledge translation in exercise for falls prevention has not been addressed for EPs. Therefore the challenge presented was to investigate the best way(s) to build workforce capacity in falls prevention within the current and future EP profession by developing and delivering an evidence-based curriculum for undergraduate, post-graduate and continuing education programs.

Statement of purpose

The purpose of this PhD was to provide a systematic approach for building workforce capacity and enhanced translation of research evidence through the use of undergraduate, post-graduate and continuing education programs within the EP profession. This was achieved by developing, implementing and evaluating undergraduate, post-graduate and professional continuing education programs for falls prevention. It is expected that the outcomes of this research will provide the current and future EP workforce with the knowledge, skills and confidence to effect positive changes in the provision of exercise for falls prevention across all exercise programs for older people.

Specific Aims

1. Using a representative sample across two States in Australia, establish the current level of knowledge of undergraduate human movement and exercise and sports science students and post graduate exercise rehabilitation/EP students with regard to falls risk and exercise prescription for fall prevention in older people.

2. To determine undergraduate and post graduate student knowledge gains, retention of knowledge and confidence following participation in an evidence-based exercise for falls prevention curriculum.

3. To determine the level of knowledge and confidence to prescribe exercise for falls prevention achieved by practicing accredited EPs both before and after participation in an evidence-based continuing education program and to compare undergraduate and post-graduate students' level of knowledge of falls, falls risk assessment and confidence with exercise prescription for falls prevention, to qualified EPs in the workforce.

4. To conduct a cluster controlled evaluation across three Australian states, of two different EP continuing professional educational delivery modes: face to face workshop and online delivery, compared to a control group.

5. To determine the level of knowledge retention and confidence levels, six months after participation in an evidence-based continuing professional education program for EPs.

6. To make recommendations for university-based undergraduate and post-graduate programs regarding the provision of specific falls prevention curricula to enhance future workforce capacity in exercise for falls prevention programs.

7. To make recommendations on the outcomes of different delivery modes for continuing education programs for EPs.

Structure of the thesis

This thesis is presented in 10 chapters which support the six phases of the PhD study (Figure 1). The first three phases of the PhD were based on a project funded by the Commonwealth Department of Health and Ageing (DoHA) (Appendix 1). The overall presentation of this thesis reflects the nature of action research conducted in the 'real-world' practice setting and as such would be inappropriate to present in a traditional thesis format. Five of the nine chapters (Chapters 2, 3, 5, 7 and 8) are presented as papers which have been published, prepared or submitted for publication. Authorship statements for papers written in collaboration with other authors are included as a preface to each chapter and include signed declarations of percentage contribution for each author.

Chapter 2 – Continued workforce development required for exercise physiologists in falls prevention to help meet the needs of an ageing Australia

Chapter 2 is presented in the form of paper prepared for publication. This paper highlights the need for the healthcare workforce to have a positive impact on decreasing the burden of preventable conditions in older people in Australia, it must address the prevention of falls and fall injury. Workforce development in falls prevention can be achieved by the provision of workforce learning in exercise-based professions such as exercise physiology and other related professions.

Chapter 3 - A systematic review of continuing education in exercise based allied health professions

This chapter reviews research which has evaluated continuing education programs (CEPs) in the exercise-based healthcare professions of physiotherapy, occupational therapy, athletic training, exercise physiology, and exercise science. The purpose of this systematic review was to highlight the limited published research which has evaluated the effectiveness of CEPs

to meet the combined needs of participants, the healthcare workforce and their ability to effect patient outcomes.

Chapter 4 – Overall approach and methods used in the phases of this research study

This chapter outlines the overall approach and methods used for the overall PhD study. More detailed methods are included in each chapter of results (Chapters 5 – 8) in the respective method section of each paper.

Chapter 5 – Exercise for falls prevention in older people: Assessing the knowledge of exercise science students

Phase 1 – University Scoping Survey (Published article)

> Sturnieks DL, Finch CF, Close JCT, Tiedemann A, Lord S & **Pascoe DA.** (2010). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. *Journal of Science and Medicine in Sport, Australia, 13*(1):59-64.

This phase involved detailed surveying of students across seven universities in New South Wales and Victoria, to identify the workforce training needs of undergraduate human movement and sports science students and postgraduate exercise rehabilitation students, in terms of current knowledge with regard to falls in older people, falls risk and exercise prescription for falls prevention.

Results from Phase 1 informed Phase 2 of the study by determining which elements of falls risk, falls prevention and exercise prescription needed to be included in an education program for undergraduate human movement / exercise science students and post graduate exercise rehabilitation students.

Chapter 6 - Development, implementation and evaluation of a university-based falls prevention education program (UniFPEP)

Phase 2 - Development of an evidence-based falls prevention education program (UniFPEP)

(Final report submitted to the Commonwealth Department of Health and Ageing, 2008)

Finch C, Lord S, Close J, **Pascoe D**, Sturnieks D, Tiedemann A, Twomey D. Development of a workforce education program for exercise practitioners in falls prevention and exercise prescription for older people. 2007-2008. Falls Prevention and Injury Prevention Community Grants Program, Commonwealth Department of Health & Ageing.

The results of the survey conducted in Phase 1 were used to inform the development of an evidence-based curriculum in falls prevention. Gaps in students' current knowledge of falls, falls risk, methods to prevent falls and perceived ability to deliver exercise programs for falls prevention were identified and the education program developed to address the specific deficits in knowledge.

Chapter 7 – Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP)

Phase 3 – Implementation and evaluation of a university-based falls prevention education program (UniFPEP) (Published article)

Pascoe, D. A., Sturnieks, D., Close, J. C. T., Tiedemann, A., Lord, S., Twomey, D., & Finch, C. E. (2013). Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP). *Focus on Health Professional Education, 15*(2):55-66.

Implementation of the UniFPEP occurred by integrating the evidence-based curriculum into the current class structure for third year exercise science, and Graduate Diploma students at the University of Ballarat during normal class times in teaching period 1 2008. Evaluation of the planned education outcomes from the program and participant feedback were used to further develop and improve the UniFPEP in preparation for wider implementation in universities across Australia.

Phase 4 - Development and preparation of the Fit+Fall=Free continuing education program (Fit+Fall=Free CEP)

Review and preparation of a workforce falls prevention education program (Fit+Fall=Free) was conducted following this stage of the study. This process is included in Chapter 4 as part of the overall methods for the study.

Chapter 8 - Evaluation of a continuing education program on falls prevention (Fit+Fall=Free): a cluster controlled trial.

Phase 5 – Implementation and evaluation of the Fit+Fall=Free falls prevention program as an Exercise and Sports Science Australia (ESSA) continuing education opportunity workshop using two different delivery modes.

The Fit & Fall-Free continuing education program (CEP) was implemented and evaluated to assess participants' reaction to the program and determine learning outcomes as a result of participation in the continuing education opportunity workshop. Evaluation of the overall delivery of the Fit+Fall=Free CEP was designed as a cluster controlled study to compare two different delivery modes: face-to-face workshop and online delivery compared to a control group.

The results of this phase informed the final education program in preparation for implementation as a national ESSA continuing education opportunity workshop.

Chapter 9 – Summary discussion, overall conclusions and recommendations

This chapter provides an overall summary and conclusions of the completed PhD study and makes recommendations for future areas of study.

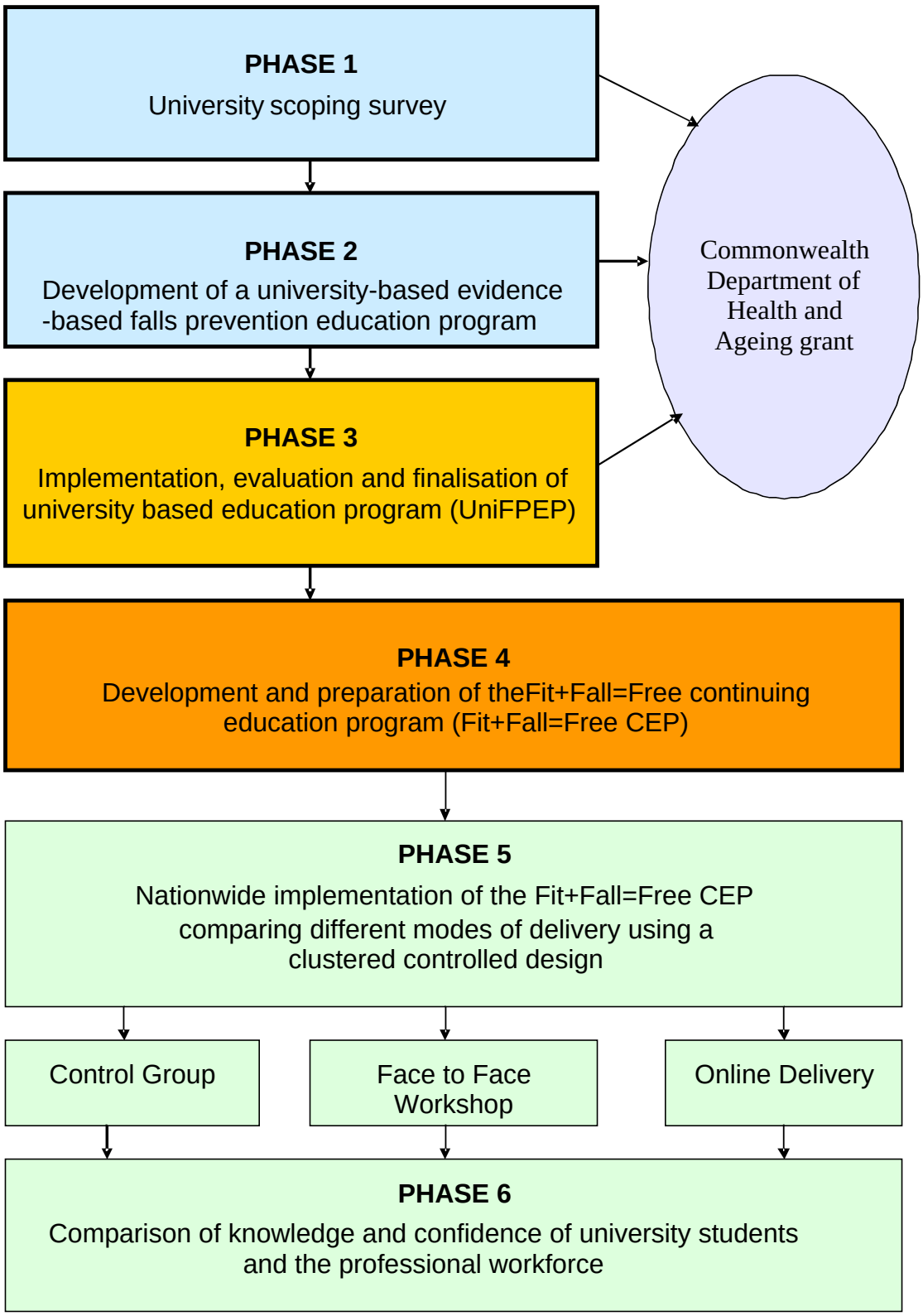

Figure 1 Phases of data collection

Framework for the study

The framework for this study was developed using a combination of three existing frameworks from the areas of capacity building,[67] knowledge translation[68] and curriculum planning for the education of adults.[69] The specific focus for the study was based primarily in the action area of workforce development within the Capacity Building Framework developed by the New South Wales Health Department.[67] The Capacity Building Framework allows the workforce development process to be initiated within an organisation or community in response to an identified strategic priority which ensures people working within the systems have the abilities and commitment to contribute to health promotion goals.[67] Workforce development within the Capacity Building Framework can be accomplished by the provision of workforce learning, external courses and professional development opportunities, teaching into undergraduate and post-graduate courses and providing professional support and supervision by putting in place performance management systems. Although the capacity building framework provides a model for overall or large scale capacity building, workforce development is only one of five key action areas with has a further six subset areas of focus (Figure 2). The focus of this PhD study was directed to provide a significant contribution to workforce development within the Capacity Building Framework.

The UniFPEP and Fit+Fall=Free CEP programs developed and delivered within the context of this PhD, targeted the accredited EP profession through undergraduate and post-graduate programs by teaching directly into university-based programs and providing professional development opportunities in the form of continuing professional education courses. These three areas of focus (highlighted in blue in Figure 2) provided an avenue to assess the potential for capacity building through targeting development of both the future and current EP workforce.

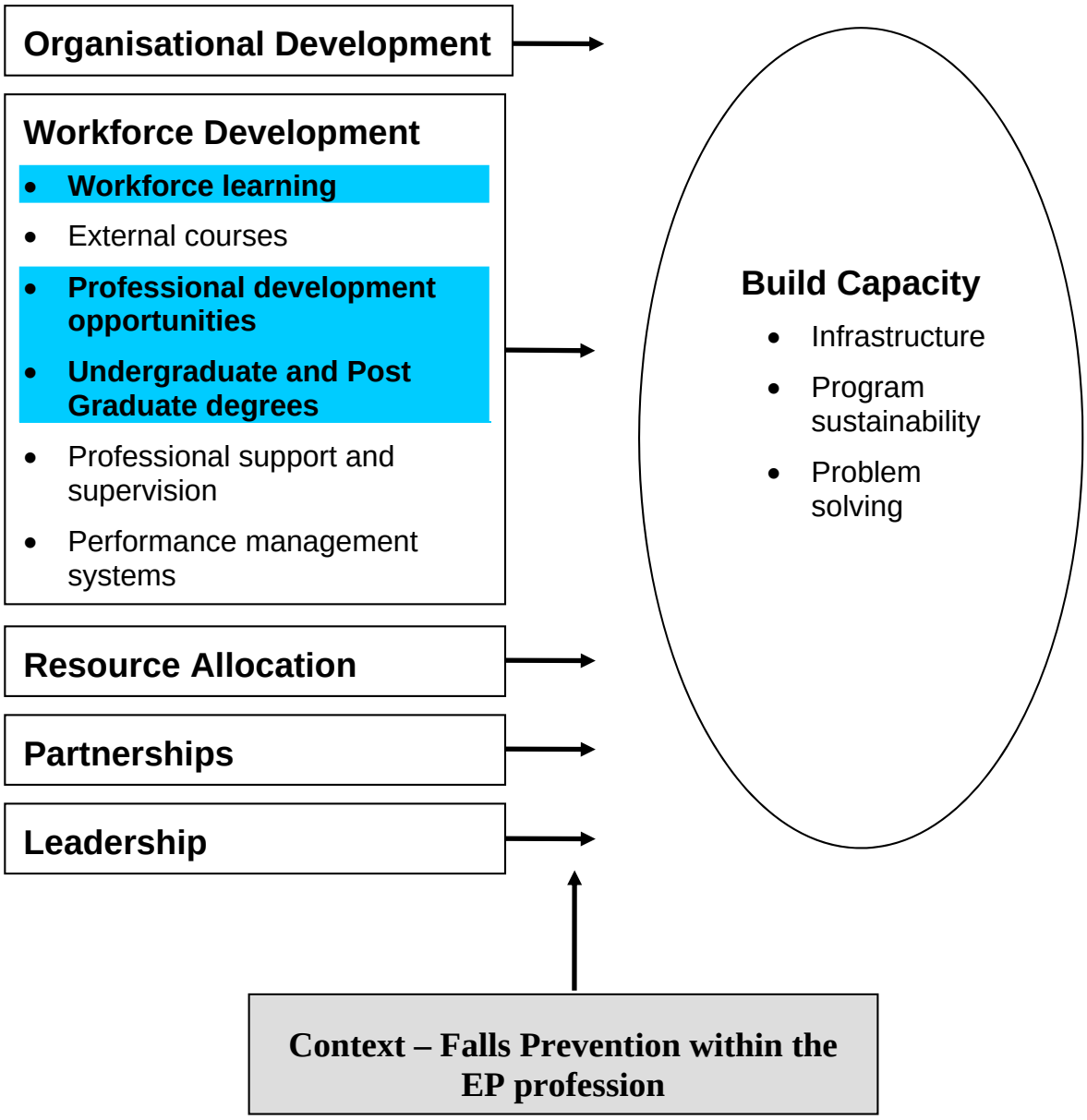

Figure 2 Capacity building framework (adapted from NSW Health Department)[67]

The provision of this targeted workforce capacity building required the development of an evidence-based curriculum for both the university-based (UniFPEP) and practitioner-focused (Fit+Fall=Free CEP) courses. The falls prevention UniFPEP and Fit+Fall=Free CEP curricula provided the opportunity and pathway for the transfer of research evidence into practice, using the principles outlined in the knowledge to action (KTA) framework.[68] The KTA framework was

specifically developed to enhance the translation of knowledge through continuing education in the health professions. The KTA framework highlights the importance of understanding the complete KTA process, including the range of stakeholders involved beyond practitioners, and conceptual frameworks that may be useful for facilitating the use of research in practice settings (Figure 3).[68]

In the context of this PhD, the KTA framework provided a process of knowledge transfer which could be tailored to meet the specific needs of EPs in response to the mounting falls prevention research evidence and the unequivocal research support for the role of exercise and physical activity in the prevention of falls.[44,57,70,71] The KTA framework required that once the specific problem of falls prevention had been identified, the selected research knowledge needed to be adapted to the AEP context and interventions selected, tailored, and implemented. The KTA framework also encouraged monitoring of knowledge use, barriers to knowledge use, and the evaluation of outcomes to ensure that knowledge use is sustained.

Although the KTA framework provided a conceptual map for the KTA process and encouraged an integrated approach between the research evidence, stakeholders and practitioners it did not provide methods for implementation and/or methods for evaluation to ensure the desired outcomes were achieved. It is possible that an inability to measure the effectiveness of the knowledge transfer could be strongly influenced by the methods used to implement the knowledge transfer and the methods used to evaluate the degree of knowledge transfer.

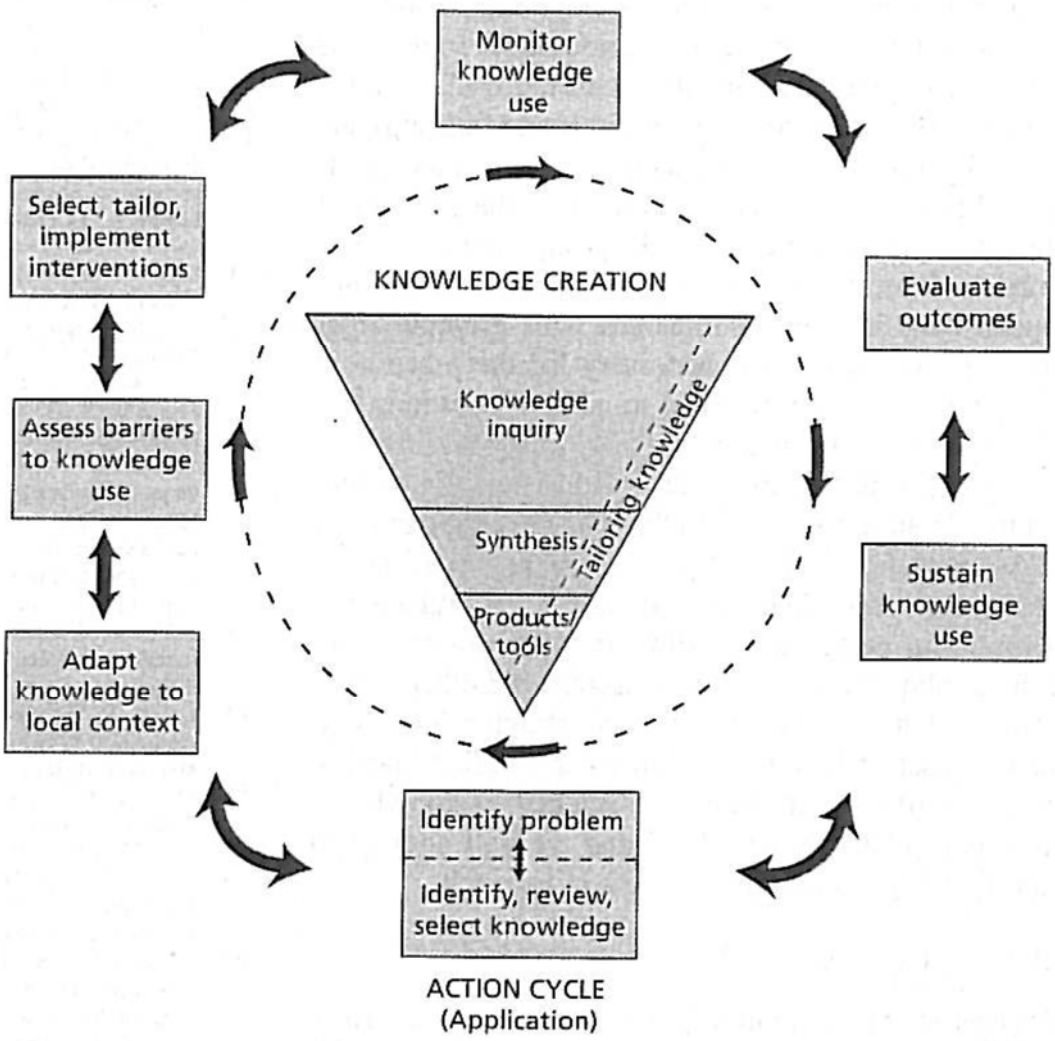

Figure 3 Knowledge to action framework[68]

Therefore, if workforce capacity building through knowledge translation is to benefit all involved parties, the methods used to implement the translation of knowledge and provide the essential workforce education, needs to be based on sound educational principles[69] and be appropriately evaluated[72] to ensure the appropriate knowledge transfer has taken place. Whilst these two elements are implicit in the KTA framework they are not explicitly addressed within either the KTA or the capacity building frameworks. The capacity building framework provides a 'what needs to be done' approach rather than a 'how to' application model and although the KTA framework provides an easy to follow map to bring knowledge to action, from an educational perspective the two vital elements overlooked are 'how to' implement the intervention[69] and 'how to' evaluate[72] the outcomes. For the full potential of the KTA framework

to be realised and create the large scale changes aimed for in the Capacity Building Framework, the methods of implementation[69] and evaluation[72] must be addressed and should form part of the focus of these frameworks.

Any knowledge transfer or workforce development program targeted at educating adults through either university-based courses or continuing professional education programs needs to be implemented using sound adult learning theory. Adult learning theory, as outlined by Gagné,[73] emphasises both the teaching and learning aspects of educating adults based on understanding the relationship between learning and teaching. By allowing the adult learner to progress through the seven types of hierarchical learning from stimulus response, motor and verbal chaining, multiple discrimination, concept learning, rule learning to problem solving and integrating signal learning, adults become educated problem solvers.[73] Progressing the learner through to problem solving is an approach to learning and teaching used frequently in the education of adults and supports Bloom's taxonomy of educational objectives.[74] Gagné[73] proposes that adult learners use their problem solving skills when faced with new but similar problems as those presented in a teaching/learning situation. This level of knowledge transfer is required by EP practitioners and future allied health professionals to ensure they have the knowledge, attitude and skills to correctly apply new concepts in their specific work setting.

Adult learning theory, coupled with the curriculum planning model proposed by Jarvis[69] (Figure 4), are implied components of both the Capacity Building (workforce learning, professional development opportunities) and KTA Frameworks (adapt knowledge to local context, implement interventions) but are only referred to as stages within a multi-stage process. If the implementation strategy and the method of evaluation applied in either of these frameworks are not effective in producing the desired outcomes the workforce learning, professional development (Figure 2), adapting knowledge to local context and implement intervention (Figure 3) then these stages have the potential to undermine the performance and merits of both frameworks. The capacity building and KTA frameworks are underpinned by the belief

that the content/knowledge presented to students or practitioners is, in fact, transferred to or learned by the participant.

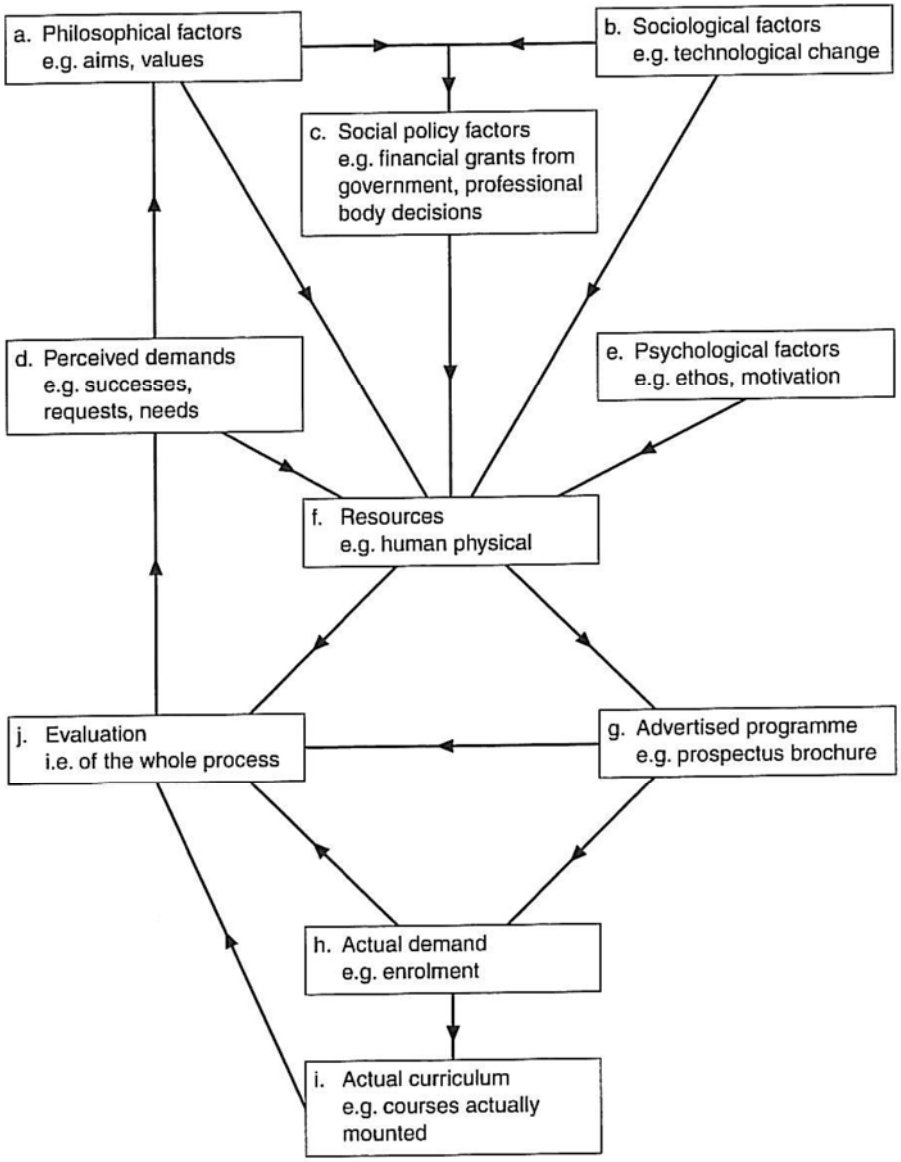

Figure 4 Curriculum planning model for the education of adults[69]

However, Jarvis[69] reminds us that in all facets of teaching and learning one of the main outcomes that must be checked, is that learning has indeed taken place. This suggests that even though teaching is the intention of delivering an evidence-based curriculum, there must be some attempt to assess that the teaching, delivery or implementation process has in fact

been successful in other words the aim of teaching is to bring about learning[75] but if unsuccessful – is it the teaching or the learning that has been unsuccessful?

In addition to ensuring they meet their learning objectives, attempts at workforce development are costly and time consuming so need to be evaluated to measure their effectiveness. With this in mind, Kirkpatrick's[72] four-levels of training evaluation model has been used by many organisations for over thirty years to assess the effectiveness of training. Kirkpatrick's four levels model provided the framework for the evaluation of both the university-based (UniFPEP) and continuing professional education (Fit+Fall=Free CEP) curricula in this thesis. The four levels model evaluates the sequential process from participant reaction, learning, behaviour and results achieved after participation in a training/education program (Table 1). The first level, *reaction*, measures how those who participate in the education program react to it. The *learning* level is the extent to which participants changed attitudes, improved knowledge and increased skill as a result of the program. One or more of these changes need to take place if changes in behaviour are going to occur. The third level of *behaviour* is the extent to which a change in behaviour has occurred as a result of participation in the program. The fourth and final level of the model, *results,* are the final outcomes that occur due to the participant's attendance and completion of the program.

Table 1 summarises how the Kirkpatrick model[72] was applied to the evaluation of the workforce development curriculum for exercise professionals in relation to falls prevention. The fourth level *results* would be measured in terms of observing a decrease in falls in older people who undertake exercise programs prescribed by exercise professionals who have actively incorporated falls prevention exercise strategies as a result of their prior participation in an 'exercise for falls prevention' curriculum program.

For the current and future EP professionals to begin to fill the void in the falls prevention workforce, there needs to be a concerted effort in the provision of falls prevention education

programs across both the university education and professional health care sectors. To affect a change, this would also require significant success across all four levels of Kirkpatrick's model.

Table 1 Kirkpatrick's four level evaluation model applied to workforce development for exercise professionals for falls prevention

Level 1	Reaction	Exercise professionals engage in exercise prescription for falls prevention education programs. Generally, such programs are yet to be widely developed or implemented.
Level 2	Learning	Exercise professionals demonstrate increased knowledge and confidence in the prescription of exercise for falls prevention as a result of their education.
Level 3	Behaviour	Exercise professionals implement widespread evidence-based exercise programs targeted at falls prevention in the community and across all sectors of the health care system.
Level 4	Results	Population wide decrease in falls and fall-related injury is demonstrated, perhaps through the use of routinely collected data and injury indicators.[76]

The integration of the three established frameworks of capacity building, knowledge translation and the curriculum planning model for the education of adults coupled with sound adult learning theory allowed the formulation of a pathway to investigate possible solutions to the burgeoning health crisis of falls in older people (Figure 5). By focusing on the widespread problem of falls in older people and targeting the allied health profession of EP within Australia, this study provides a new approach to building health care capacity, while meeting the needs of allied health professionals through the provision of evidence based continuing education programs (Figure 5).

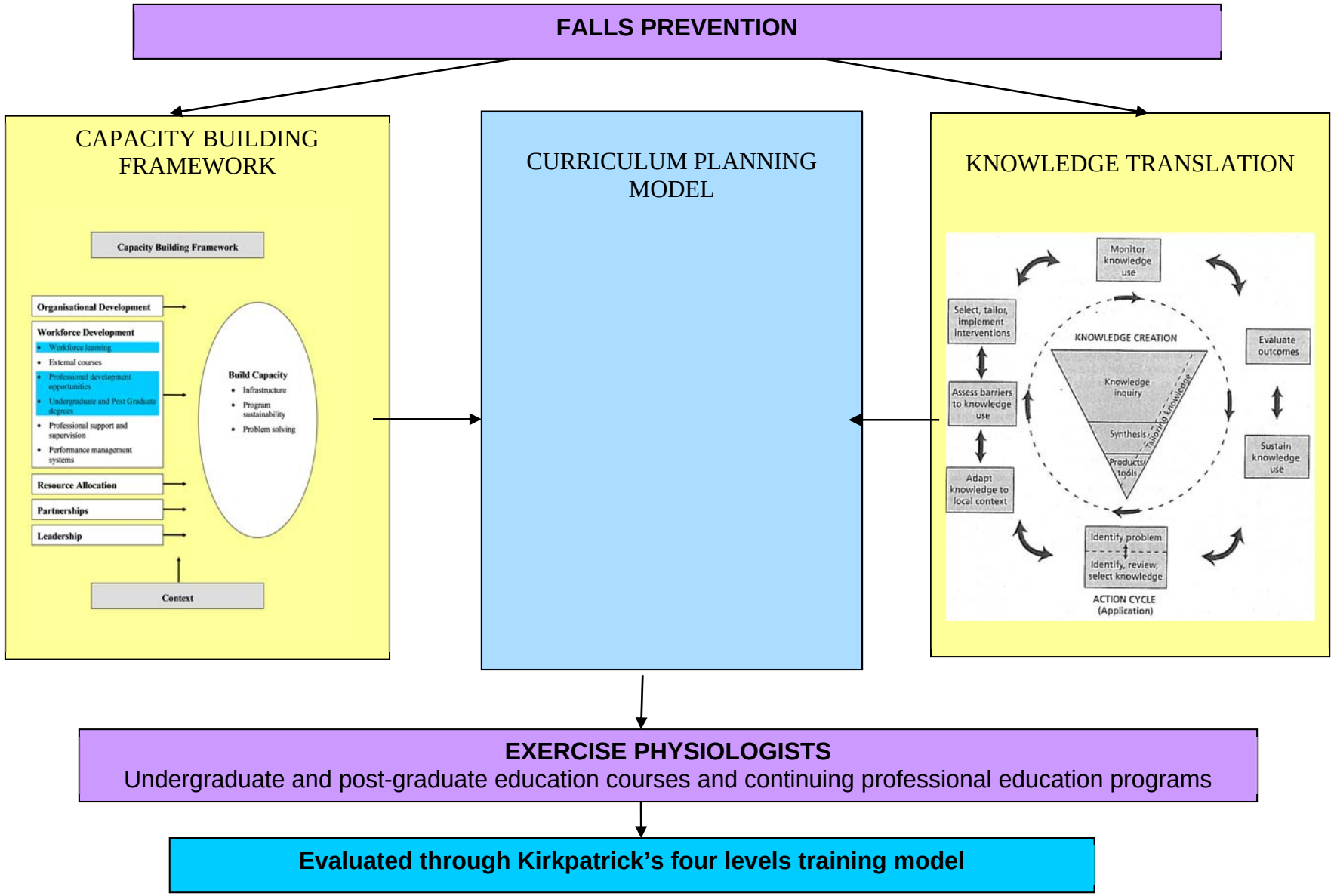

Figure 5 Thesis framework combining strategic elements of the capacity building framework to allow the translation of knowledge to occur by applying adult learning theory to curriculum planning

Significance of the study

Falls are a significant health issue

The number of people in Australia aged over 65 years is projected to double during the next 50 years.[13] With one in three people living in the community over the age of 65 years experiencing at least one fall each year[1] this suggests that the number of falls and fall related injuries are also set to escalate. The increasing age of the population will lead to an increase in the demand for health services and, unless effective preventive strategies are put in place, a large proportion of the health care burden will be associated with fall related injury.[13]

Need for workforce development

Federal and State Government falls prevention initiatives in Australia include recommendations for exercise to prevent falls in older adults.[63-65] Workforce capacity building initiatives for falls prevention are important because of their potential wide-reaching effects to create an attitudinal change towards exercise and reducing falls in future years. However, for a more immediate reduction in the incidence of falls, the evidence suggests that there is a need for individually prescribed and supervised exercises provided by a trained exercise specialist.[71] To date this role has fallen primarily within the limited field of physiotherapy, but given the ageing population and increasing burden of disease there is a significant need to build capacity within the broader exercise-based healthcare workforce.

Implementation and evaluation of Education Programs

Methods of translating research into practice and frameworks to bring about capacity building through workforce development.[67,68,77] have attempted to deliver the research evidence to allied health practitioners,[78] and policy makers have formulated the Capacity Building Framework to demonstrate what strategies may be targeted to achieve workforce development in relation to building healthcare capacity.[67] Both frameworks include the implementation of educational interventions and the subsequent evaluation of the

implementation. From an academic teaching perspective, there is a need to bring these two frameworks together to provide an integrated framework to link workforce development and knowledge translation. Both frameworks would benefit from the application of adult teaching and learning theory and curriculum planning during the implementation stage and evaluating the effectiveness of the implementation using Kirkpatrick's four-levels of evaluation.

To bring about a population-wide decrease in falls and fall-related injury through a better informed workforce, it is essential to test the impact of any implementation strategy to measure the knowledge uptake that has taken place to demonstrable that learning has indeed taken place. In both university-based and continuing education programs, a successful outcome relies on the learner's ability to retain an appropriate level of knowledge and then begin to integrate this new knowledge into their professional practice. If knowledge uptake does not occur then the aims of the capacity building framework will not be realised and the translation of knowledge will fail.

However, a well-planned strategy is required to specifically target and educate the EP profession to ensure falls prevention is being adequately addressed in all exercise prescription programs for older people. To make an impact on decreasing falls through exercise interventions, a focussed approach aimed at systematically educating a whole workforce within the Australian allied health sector is required. With the provision of evidence-based education programs highlighting the problem of falls, and the associated personal and health care costs, exercise interventions for falls prevention could be incorporated into regular EP prescribed exercise programs with relative ease.

Education programs aimed at all levels of education and training for EPs would have the potential to develop a workforce that is well-prepared to become leading advocates for fall prevention across Australia. Exercise physiologists provide exercise for rehabilitation across the broader community and have the specific role of providing exercise for the prevention and

management of chronic and complex conditions.[62] Although falls prevention is not listed specifically as a target pathology within the ESSA accreditation criteria, according to the British Geriatrics Society[79] frailty should be considered a chronic health condition and as falls are the main symptom of frailty, falls could fall under this accreditation heading in future. Exercise and Sports Science Australia acknowledges that their accreditation document list of target pathologies is not exhaustive and that the primary criterion for inclusion is, there needs to be, an evidence base of exercise efficacy for the condition. The secondary inclusion criteria is that the condition has been identified as a National Health priority.[63] Falls prevention, as the main symptom of frailty, meets these two key criteria for inclusion as an EP target pathology as there is an extensive evidence base of exercise efficacy[44] and falls are a National health priority.[63] Clearly, exercise prescription for falls prevention lies within the scope of practice of an EP.[62]

The aim of this thesis body of work was to deliver and evaluate an evidence-based, exercise for falls prevention education program aimed at providing the EP profession with the knowledge and confidence needed to develop and implement programs to prevent falls and falls related injury in community and rehabilitation settings. This study developed, implemented and evaluated an evidence-based falls prevention education program for undergraduate and post-graduate exercise science students and the current EP workforce to ensure graduates and practitioners are fully equipped to join community-based efforts in the delivery of exercise programs to prevent falls. The falls prevention education program was also implemented and evaluated as a workforce education program delivered as a continuing professional education workshop for accredited EPs to encourage the integration of exercise prescription for falls prevention into general EP practice.

Ethics

Ethics approval was granted by the University of Ballarat Human Research Ethics Committee on the August 29 2007, (Project Number A07-104) (Appendix 1A) for completion of the Falls Prevention Education Program (first 12 months of the study) funded by the Commonwealth Department of Health and Ageing.

Ethics approval for phases 4-6 was granted on October 12 2008, by the University of Ballarat Human Research Ethics Committee (Project Number A08-128) (Appendix 1B).

Chapter 2

Continued workforce development required for exercise physiologists in falls prevention to help meet the needs of an ageing Australia

The following chapter was prepared for submission to the *Health Promotion Journal of Australia*

Pascoe DA, & Finch CF. Continued workforce development for exercise physiologists in falls prevention to meet the needs of an ageing Australia.

This chapter has been removed at the authors request.

Chapter 3

A systematic review of continuing education in exercise-based allied health professions

The results of this systematic review were presented at the Australian and New Zealand Association for Health Professional Educators national conference in June 2011.

Pascoe, DA, Finch, CF, & Donaldson, A. Evaluation of continuing education programs (CEPs) for allied health professionals. *ANZAHPE 2011 LOCAL? GLOBAL? Health professional education for social accountability*. Alice Springs, Northern Territory, Australia 27 June - 30 June 2011.

This chapter has been removed at the authors request.

Chapter 4
Overall approach and methods used in the phases of this research study

Introduction

This PhD study used action research and applied a concurrent mixed methods approach[143,144] to ensure the strengths of both qualitative and quantitative research techniques were applied for best effect at each phase of the study. Creswell[143] suggests that quantitative methods are appropriate for testing the effectiveness of interventions while qualitative methods allow exploration of a problem with a paucity of research. The application of a mix of research techniques, methods and approaches was structured in a systematic manner that focused directly on the most appropriate way to address each research problem.[145] More detailed research methods and specific study designs are included in each of the following chapters to provide context and clarity to each interdependent phase of the research progression of this PhD study.

Theoretical constructs

Overall, this research aimed to develop, apply and evaluate a systematic approach to translating research knowledge into professional development programs to progress workforce capacity in exercise prescription for falls prevention. This was achieved through teaching into undergraduate and post-graduate university programs and providing continuing education programs within the allied health profession of EP in Australia. The three interdependent and overlapping theoretical constructs upon which this research was centred included the two relatively disparate areas of capacity building[67] and research knowledge translation[78] brought together by adult learning theory[69] to facilitate the dissemination of information through workforce education across undergraduate, post-graduate and continuing professional education programs.

Capacity building is defined as an approach to developing sustainable skills, structures, resources and commitment to improve the health sector to prolong and multiply health gains many times over.[146] Capacity building within the Health Capacity Framework for health promotion development can be used either within programs, or more broadly within health systems, which allows capacity building activity to be developed with individuals, groups, organisations or communities.[67]

There are three identified dimensions of the Capacity Building Framework[67] which clearly articulate with the intent of health promotion efforts. These are:

- to address the development of infrastructure or services;
- enhance program maintenance and sustainability, and;
- foster problem solving capabilities.

When applied to the area of workforce development in falls prevention, the Capacity Building Framework[67] allows services in falls prevention to be developed and commenced with a view for these programs to be sustainable enough to address both the current and future needs of

a community. In this way, falls prevention programs can be established to help meet current and future demands being placed on the healthcare system with the increasing needs of the ageing population in Australia.

The above three dimensions of the Capacity Building Framework[67] have a further five key action areas which provide a strategic focus for building capacity:

- organisational development;
- workforce development;
- resource allocation;
- partnerships; and
- leadership.[67]

The primary focus of this study was in the action area of workforce development. Within this context, workforce development refers to a process initiated within an organisation or community in response to an identified strategic priority, to ensure that people working within the systems have the abilities and commitment to contribute to health promotion goals.[67] Based on the Capacity Building Framework[67], workforce development can be achieved by the provision of workforce learning, external courses and professional development opportunities. Workforce learning can also be achieved by teaching into undergraduate and post graduate courses, providing professional support and supervision and by putting in place performance management systems.

The falls prevention education programs developed through this PhD, were delivered using adult education learning strategies[69] to provide workforce education within the Accredited Exercise Physiology field. Workforce development in this study targeted both the university and allied health sectors through the fields of exercise science and exercise physiology, by providing falls prevention education programs for the exercise professionals of the future and the current EP workforce. This approach allowed investigation into the potential for capacity

building across three broad components of workforce learning, undergraduate and post-graduate degree programs (UniFPEP) and professional development opportunities (Fit+Fall=Free).

Whilst the overall study was contextualised within the Capacity Building Framework of health promotion, it was fundamentally an education/training approach, investigated over a series of studies, which required evaluation from a professional education training context. Kirkpatrick's[72] four levels of evaluation were therefore used to evaluate the University (UniFPEP) and the Workforce (Fit+Fall=Free) Falls Prevention Education Programs, to measure the participants' reaction to the programs, learning outcomes and behaviour changes as a result of participation in the programs. The Kirkpatrick model[72] therefore provided the framework for the quantitative part of the research.

The Kirkpatrick[72] four levels of evaluation represent a sequential process in which each level relies on the results of the previous level in order to provide more valuable information to the overall evaluation process. In an endeavour to gather and provide rich qualitative data at each level of the Kirkpatrick model,[72] standard health promotion evaluation techniques were integrated into the evaluation at each level. By integrating evaluation techniques provided within Kirkpatrick's four levels with accepted and commonly used health promotion evaluation techniques[147] each phase of the evaluation process was customised to ensure detailed feedback was gained from participants regarding their reaction, learning and behaviour change as a result of participation in the programs.

Framework for evaluation of the education programs

The four levels of Kirkpatrick's model[72] for evaluating training programs in sequential order are *reaction, learning, behaviour* and *results.* The first level, *reaction,* implies that evaluation on this level measures how those who participated in the program reacted to it. During the delivery stage of the UniFPEP and Fit+Fall=Free the participants' reaction to the program was

evaluated both quantitatively and qualitatively using Likert rating scales and participant feedback, suggestions and comments. All *reaction* feedback from participants was anonymous to ensure a thorough and honest response reaction was gained. The participants' *learning* such as knowledge gain, skill development and change of attitude was evaluated quantitatively by individual tests and quizzes to determine increased knowledge. Qualitative measures such as the observation of participants' application of skills was used to determine skill improvement while questionnaires were used to determine attitude change as a result of participation.

Kirkpatrick's[72] third level of *behaviour* was determined by the extent to which a change in behaviour occurred as a result of participation in the respective programs. At this level of Kirkpatrick's evaluation process, there are four conditions which may have influenced the participants' ability to affect changes of behaviour. After completing the falls prevention education programs, the participants' needed to have the desire to change, know what to do and how to do it and be working in an environment which was supportive of the participant's perceived (feelings of satisfaction, pride and achievement) and actual (increased recognition, praise or monetary) rewards for implementing change. Evaluation at this level was conducted with working EP professionals as part of the Fit+Fall=Free program and used interviews and follow-up questionnaires to enable potential barriers and facilitators to changes of behaviour to be taken into account.

The fourth and final level of the Kirkpatrick[72] model, *results* from both the UniFPEP and Fit+Fall=Free which are defined as the final outcomes that occur due to participants' completion of the education programs was beyond the scope of this study. To adequately determine the final *results* outcomes of the UniFPEP and the Fit+Fall=Free a measure of falls in the elderly who attended exercise programs prescribed and conducted by AEPs following participation in either of the education programs. This PhD study employed a thorough evaluation of both the UniFPEP and the Fit+Fall=Free programs across the first three levels

of the Kirkpatrick model. This structured evaluation process provided an excellent framework for evaluating the overall results of both programs.

Methods used for each phase of the PhD study

This study consisted of a series of six phases designed to systematically develop, implement and evaluate a university-based and a workforce-based education program in falls prevention for both current and future accredited exercise physiologists. Completion of the six phases of the study provided an evaluation of a strategy to develop workforce capacity within the Accredited Exercise Physiology profession to impact falls prevention in the future through the provision of targeted exercise programs.

The first three phases of the study formed part of a Commonwealth Department of Health and Ageing (DoHA) project funded by a grant from the Falls and Injury Prevention Community Grants Programs (Appendix 1). The DoHA project was conducted by a partnership of researchers from the School of Human Movement and Sport Sciences at the University of Ballarat (Professor Caroline Finch, Ms Deborah Pascoe and Dr Dara Twomey) and the Prince of Wales Medical Research Institute, University of New South Wales (Professor Stephen Lord, Dr Jacqueline Close, Dr Daina Sturnieks and Dr Anne Tiedemann). Figure 1 (Chapter 1) shows an outline of the six phases of the PhD study incorporating the five stages of the DoHA grant project.

Phase 1 – University Scoping Survey

Phase 1 of the study involved detailed surveying of students across seven universities in New South Wales and Victoria, to identify the workforce training needs of current undergraduate Human Movement and Exercise/Sport Sciences students and postgraduate Exercise Rehabilitation students in terms of their current level of knowledge in regards to older people's falls, falls risk assessment and falls prevention. The methods and results of this phase of the

PhD study are presented as Chapter 5 in the form of a paper which was published in the *Journal of Science and Medicine in Sport* titled “Exercise for falls prevention in older people: assessing the knowledge of exercise science students.”[148] The results from this survey provided the platform and underpinning evidence for the development of the UniFPEP**.**

Phase 2 – Development of an evidence-based falls prevention education program (UniFPEP)

The results of the university scoping survey in Phase 1 informed content and development of the university based education program (UniFPEP), to ensure current deficits in students’ knowledge of falls risk, methods to prevent falls and perceived ability to deliver a falls prevention exercise program were addressed. The development of the evidence-based falls prevention exercise prescription for older people curriculum (UniFPEP) was developed by expert academics and researchers working primarily in the fields of falls prevention research, university curriculum development and delivery of university based education programs. Methods used are detailed in Chapter 6 and Chapter 7 of this thesis.

Phase 3 – Implementation and evaluation of a university-based falls prevention education program (UniFPEP)

The UniFPEP was implemented and evaluated at the University of Ballarat by incorporating its delivery into existing university courses (Figure 7). The methods and results for this phase of the research were divided into two separate parts which encompassed both quantitative and qualitative evaluation and presented in Chapters 6 and 7. Chapter 6 presents the development, implementation, results and evaluation of the confidence, practical skills development and evaluation of the UniFPEP. Chapter 7 is presented as a paper published in the Focus on Health Professional Education journal, entitled ‘Knowledge outcomes and retention of a university based falls prevention education program (UniFPEP),’ with co-authors Sturnieks DL, Close JCT, Tiedemann A, Lord S, Twomey D, & Finch CF. Evaluation of

participant knowledge gain, retention and confidence to prescribe exercise for older people and exercise prescription for falls prevention was included in this paper.

Week 1	**Week 1 – 3**	**Week 3**	**Week 4 – 15** (including 2 week break)	**Week 16** (Exam period)
Pre-test	3 week implementation during normal class time	**Post-test**	Completion of normal classes during semester	**13 week Post-test**

Figure 7 Implementation timeline for the UniFPEP

Phase 4 - Development and preparation of the Fit+Fall=Free continuing education program (Fit+Fall=Free CEP)

Based on the outcomes of the evaluation, the UniFPEP was modified to ensure it provided optimal learning, translation of evidence-based knowledge and met the expectations of participants. Following minor changes, the UniFPEP integrated a wide range of teaching and learning resources that included, falls risk assessment tools, key elements of successful falls prevention programs sourced from the research literature, example programs, example exercises, guidelines and methods of exercise prescription progression, checklists for contraindications for exercise, suggestions for medical and community service links, and ideas for maintaining participant motivation and compliance. Based on the feedback and evaluation from the UniFPEP, the fall prevention education program was adapted to meet the needs of broader university education programs (short and long versions).

To meet the additional needs of capacity building throughout the EP workforce, the nine-module format of the UniFPEP underwent further development to enhance the on-line resource component. In this way, the resultant flexible structure of the curriculum (Fit+Fall=Free falls prevention education program) allowed the program to be used as a

classroom-based resource, a self-directed web-based resource or any desired combination of flexible delivery that may be required to meet a range of targeted learning outcomes and support and facilitate vocational transition.

Following finalisation of the Fit+Fall=Free program, the curriculum structure and content was reviewed by key members of ESSA including members of its Accreditation and Curriculum Committee (ACC). This review was required to determine the suitability of the program for acceptance as a Continuing Education Opportunity for currently employed EPs. The Fit+Fall=Free program was then formally submitted to the ESSA Continuing Education Committee (CEC) for accreditation as a continuing education opportunity (CEO). Accreditation was granted on 15th October 2008 (see Appendix 3).

Phase 5 – Implementation and evaluation of the Fit+Fall=Free falls prevention program as an ESSA continuing education opportunity workshop using two different delivery modes

The Fit+Fall=Free curriculum was implemented and evaluated as an ESSA continuing education opportunity in November - December 2008 across three capital cities in Australia. The Fit+Fall=Free exercise for falls prevention program was delivered as a three armed clustered controlled trial (CCT) comparing two different delivery formats to a control. A face-to-face workshop was delivered in Sydney (F2F) and compared to an on-line web-based format in Brisbane (Online) and the control group in Melbourne (Control). Even though the delivery of the CCT was focussed around the three capital cities, the respective continuing education opportunities were advertised state-wide and attracted participants from throughout each state.

All three groups completed the same pre-test and post-test survey immediately before and immediately after the respective continuing education program (CEP). The time-line for each CEP format was staggered over a four week period with the Online and Control groups allowed

a period of two weeks to complete the CEP, commencing with the pre-test and finishing with the post-test and evaluations. The F2F CEP was conducted as a full day (seven hour) workshop where the pre-test was completed before any material was disseminated and the post-test and evaluations were completed at the end of the day. Figure 8 shows the time-line associated with delivery of the CCT. Full details of the methods and results of the CCT are presented in Chapter 8 of this thesis.

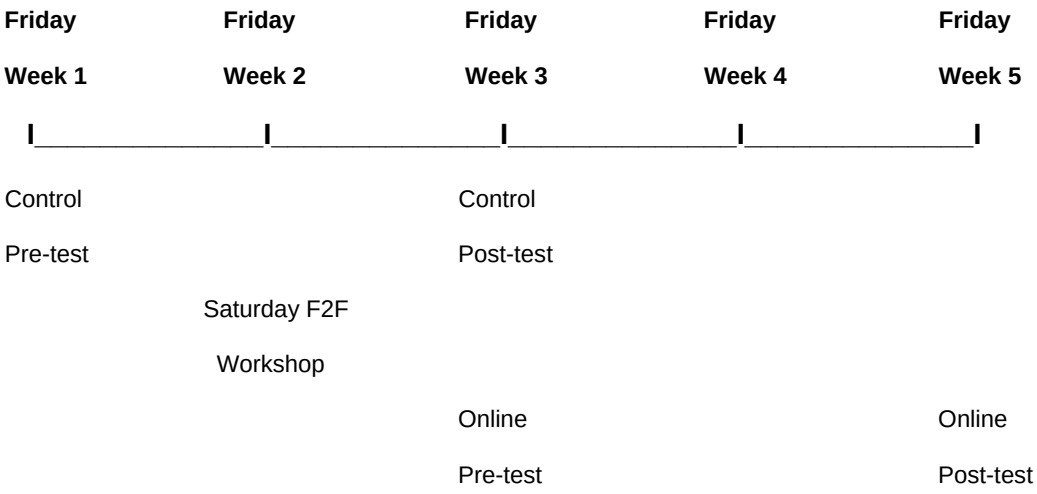

Figure 8 Timeline for the delivery of the Fit+Fall=Free CEPs

All participants from each CCT group completed the post-test knowledge survey six months after completion of the respective Fit+Fall=Free CEP to determine the extent of knowledge retention with regard to older people's falls, falls risk assessment and exercise for falls prevention. The participants from the three Fit+Fall=Free CEP groups were also asked to complete an overall evaluation of the Fit+Fall=Free CEP and invited to participate in face to face interviews at the six months follow-up time period, to determine their perception of the impact of the program on behaviour change with regard to exercise prescription for falls prevention. Figure 9 shows the timeline of the tests and evaluations completed at each stage of the CCT.

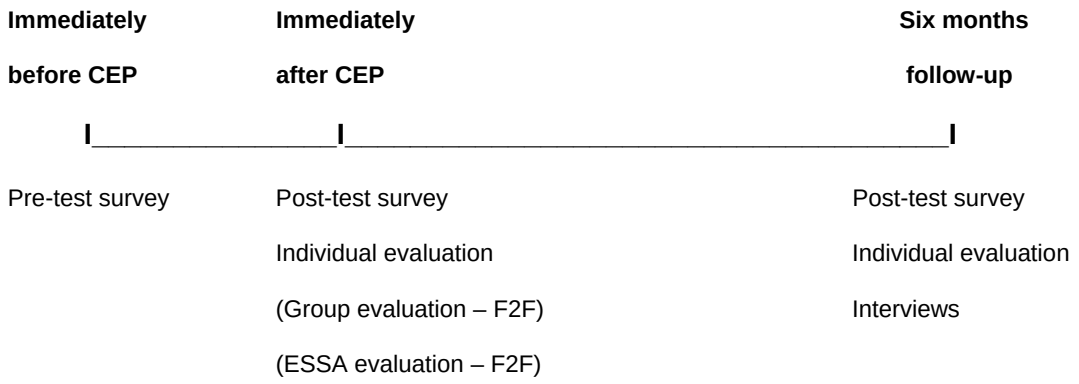

Figure 9 CCT timeline and testing

The interview participants were asked a set of structured questions which were compared to the six month post-test results and individual evaluations to describe and demonstrate the extent to which the participants maintained their knowledge and awareness of the falls risk and exercise strategies for fall prevention. The results also gave an insight into the participants' impression and reaction to the content and delivery mode of the Fit+Fall=Free CEP.

The results of this phase were used to inform the final Fit+Fall=Free CEP in preparation for distribution as a national ESSA continuing education workshop as well as broader distribution to other allied health professionals.

Phase 6 – Comparison of knowledge and confidence of university students and the professional workforce

Results from the university-based UniFPEP and the workforce-based Fit+Fall=Free CEP for exercise for falls prevention were compared to determine differences in knowledge gains and confidence between the future and current exercise physiology workforce. Results from this comparison inform the expected outcomes following delivery of evidence-based education programs within university programs or as professional CEPs.

Chapter 5

Exercise for falls prevention in older people: Assessing the knowledge of exercise science students

The following chapter is a word document version of the actual manuscript published in the *Journal of Science and Medicine in Sport, Australia* with tables, figures and referencing changed to be consistent with the presentation of this thesis format.

The final published manuscript, including supplementary files is presented in pdf format in Appendix 3 (The published manuscript in Appendix 3 has been removed for copyright purposes, however, the published version can be found at: http://dx.doi.org/10.1016/j.jsams.2008.11.005.)

Sturnieks DL, Finch CF, Close JCT, Tiedemann A, Lord S & **Pascoe DA.** (2010). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. *Journal of Science and Medicine in Sport, Australia, 13*(1):59-64.

The results from this chapter were also presented at the Australia and New Zealand Falls Prevention Conference in October, 2008.

Sturnieks, D., Finch, C., **Pascoe, D.**, Close, J. Tiedemann, A. & Lord, S. (2008). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. Australia and New Zealand Falls Prevention Conference: Melbourne October.

Introduction

Falls present one of the most serious and costly problems associated with older adulthood. One in three community-dwelling people aged 65+ years' experience at least one fall each year[1] and more than 30% of fallers sustain injuries severe enough to require medical attention.[1,2] Falls are the leading cause of injury-related hospitalisation in older people and often mark the beginning of a decline in function and independence. In economic terms, the direct and indirect costs associated with falls are great and are predicted to contribute a considerable burden on the health care system in future years.[13]

There is evidence that falls are not an inevitable part of ageing and are in fact preventable. Exercise plays a major role in modifying falls injury risk factors and preventing falls in older people, [149, 150] with clinically significant reductions in falls rates following exercise interventions demonstrated in randomised controlled trials and recent meta analyses.[41,49,70]

There are increasing health agency policy directives and clinical recommendations promoting exercise as a key strategy for falls and injury prevention.[63,65,151] Historically, particular health professionals, such as physiotherapists, have been largely responsible for the prescription and delivery of exercise for older people. However, workforce capacity needs indicate that the reliance on these professionals as the only deliverers of exercise interventions for falls prevention is unsustainable and a non-generalisable approach. There is a clear role for trained exercise professionals to deliver these necessary exercise interventions to prevent falls in older people.[6]

This paper presents the surveyed knowledge levels of a future exercise professional workforce in relation to falls prevention. In particular, the extent to which current undergraduate human movement and exercise/sport science students and postgraduate exercise rehabilitation students have the pre-requisite knowledge to prescribe exercise for falls prevention in older people was assessed. The survey focussed on students' knowledge about falls risk, falls injury

prevention and exercise prescription for older adults. It was hypothesised that there would be greater knowledge with increasing year of study.

Methods

The sampling units were classes of students, identified according to university and year of study. Seven universities across Victoria (three urban, one regional) and New South Wales (two urban, one regional) were invited to participate. Universities were chosen because they had well-recognised exercise science/human movement training programs. Sampling ensured a broadly representative and large enough cohort to give a reasonably precise (i.e. +/-5%) estimate of the proportion of correct responses to the survey.

Initial telephone contact with relevant university staff was followed up by a formal letter of invitation that was accepted by all seven universities. The department head or year level coordinator nominated classes across three years of study. One university did not nominate a second year class and another did not nominate a fourth year class.

During September-October 2007, a researcher (DS/DP) visited each university to administer the survey. During nominated lecture times, students were given brief information about the survey and completion of the survey was taken as implied consent to participate. (A copy of the plain language information statement and informed consent for participation is in Appendix 4B). In all but two classes, all students attending the nominated lecture agreed to participate. The survey was completed during lecture times, usually within 10-15 minutes and immediately collected.

The survey examined knowledge in relation to falls in older people and exercise prescription for falls prevention. Preliminary questions categorised each student's university, degree, year of study, age and gender. The knowledge component consisted of 41 items, including multi-

choice (Part A), true/false (Part B) and ranking (Part C) questions, chosen in the interest of time efficiency and objective scoring. Although the survey was not formally validated, it drew heavily on similar assessment questions previously used by the researchers and underwent extensive expert validation and pilot testing. The knowledge survey is presented in Appendix 4A (Supplementary file 1).

The 31 questions in Part A required students to choose one of four stated alternatives. Each correct answer scored one mark, with a maximum Part A score of 31. Items were further categorised according to topic area: burden and cost of falls (ten questions); risk factors and assessment (five questions); physiology and biomechanics of balance and gait (nine questions); falls prevention interventions (seven questions). The percentage of correct items overall and in each topic was calculated.

Seven Part B questions required students to indicate a yes/no response to given statements. Up to seven statements were given per question. Correctly answered statements were allocated one mark. The final score was the percent correct (from a maximum of 52). Three Part C questions required students to rank a list of specified exercises as would be appropriately progressed. Each correct sequence was awarded one mark; a half mark was given where only one mistake existed in the ranking order. The final score was the percent correct (from a maximum of 3).

To provide exercise services to older people, exercise professionals should have a high level of knowledge about falls injury risk and exercise for reducing this risk. For this reason, the survey results were assessed against a desired baseline benchmark level of 70% correct, corresponding to university standards of what is regarded as enhanced knowledge in students[152] and the level set by Australian universities to determine eligibility for entry into certain graduate level courses for exercise rehabilitation and Honours. The survey was

designed, so that the difficulty of questions reflected the requisite level of knowledge that would be commensurate with someone responsible for prescribing exercise in this area.

The study was approved by the University of Ballarat Human Research Ethics Committee (Appendix 2A). Survey scoring and analysis was undertaken using SPSS 15.0 for Windows (SPSS Inc, Chicago, USA). Results are presented separately for each of Parts A, B and C.

To account for the sampling frame, whereby students were sampled through group classes at a given year level within a specific university, adjustment for clustering effects was made.[153] Differences between universities/states/regions were not of interest and therefore not assessed; however, potential university effects were accounted for in the analysis. Hierarchical Generalised Linear Modelling (GLM)[154] was used to calculate estimated marginal mean (EM) scores overall, and across survey sub-components. The Hierarchical GLM-EM model tested differences across year levels for all survey parts, and across topics within Part A, against the 70% null hypothesis level by the Wald chi-square statistic.

Results

Overall, 566 students completed the survey, with 532 completing all survey components. The average student age was 21.7 (range 19-50) years; 41.7% of respondents were second year students, 33.8% third year and 24.5% fourth year. The number of respondents by state, university and study year is presented in Table 5. Of the 566 surveys, 436 were from students from urban universities. Victorian university students comprised 59.4% of the sample. In terms of mean knowledge scores, across all survey parts, third years students performed better than second year students and fourth year students performed better than both second and third year students (Table 5).

Table 5 Number of students and comparison of GLM estimated marginal mean scores on the three parts of the survey across year levels

State	University	Year level	n	Mean % score on Part A (range)	Part A >70% (n)	Mean % score on Part B (range)	Part B >70% (n)	Mean % score on Part C (range)	Part C >70% (n)
Victoria	1	2	32	52.4 (38.7-64.5)	1	60.7 (53.8-75.0)	18	58.8 (0.0-100)	7
		3	47	59.6 (32.3-74.2)	3	62.8 (36.5-73.1)	6	71.7 (0.0-100)	5
		4	9	63.0 (61.3-80.6)	0	65.3 (57.7-75.0)	0	77.2 (33.3-100)	1
		Total	88		4		24		13
	2	2	36	50.5 (19.4-61.3)	2	58.6 (40.4-69.2)	27	44.9 (0.0-100)	7
		3	39	57.7 (29.0-74.2)	2	60.6 (48.1-73.1)	9	57.9 (0.0-100)	3
		4	17	61.0 (54.8-77.4)	4	63.2 (59.6-75.0)	26	63.3 (0.0-83.3)	11
		Total	92		8		62		21
	3	2	25	55.0 (38.7-71.0)	0	62.2 (53.9-75.0)	21	56.9 (0.0-100)	12
		3	12	62.2 (48.4-77.4)	6	64.2 (48.1-75.0)	31	69.9 (0.0-100)	18
		4	0						
		Total	37		6		52		30
	4	2	58	49.9 (25.8-71.0)	0	58.3 (38.5-73.1)	8	47.3 (0.0-100)	2
		3	20	57.1 (35.5-77.4)	5	60.4 (53.9-69.2)	23	60.3 (0.0-100)	12
		4	41	60.4 (32.3-83.9)	7	62.9 (44.2-73.1)	16	65.7 (0.0-100)	8
		Total	119		12		47		22

New South Wales	5	2	34	56.2 (32.2-74.2)	5	59.9 (46.2-73.1)	21	46.5 (0.0-100)	6
		3	32	63.4 (35.5-87.1)	8	62.0 (44.2-73.1)	19	59.4 (0.0-100)	3
		4	23	66.8 (45.2-83.9)	14	64.5 (44.2-73.1)	25	64.9 (0.0-100)	15
		Total	89		27		65		24
	6	2	49	57.2 (32.2-74.5)	3	60.2 (42.3-75.0)	17	45.0 (0.0-100)	4
		3	24	64.3 (41.9-90.3)	11	62.3 (42.3-76.9)	21	58.0 (0.0-100)	10
		4	31	67.7 (51.6-83.9)	8	64.8 (51.9-76.9)	17	63.4 (0.0-100)	7
		Total	104		22		55		21
	7	2	0						
		3	22	65.7 (45.2-93.5)	8	65.5 (50.0-75.0)	17	71.3 (33.3-100)	9
		4	15	69.1 (58.1-83.9)	10	68.0 (57.7-78.9)	14	76.8 (33.3-100)	6
		Total	37		18		31		15
Total		2	234	54.2 (19.4-74.5)	11	60.5 (38.5-75.0)	112	51.1 (0.0-100)	38
		3	196	61.5 (29.0-93.5)	43	62.5 (36.5-76.9)	126	64.1 (0.0-100)	60
		4	136	64.6 (32.3-83.9)	43	65.1 (44.2-78.9)	98	69.5 (0.0-100)	48
		Total	566	62.5 (19.4-93.5)	97	62.7 (36.5-78.9)	336	61.6 (0.0-100)	146
GLM Comparisons		overall		$\chi^2_{(2,\ n=566)}$=113.41 p<0.001		$\chi^2_{(2,\ n=566)}$=44.53 p<0.001		$\chi^2_{(2,\ n=532)}$=37.58 p<0.001	
Mean difference (p-value)		2v3		-7.17%, p<0.001		-2.06%, p=0.001		-12.94%, p<0.001	
		2v4		-10.54%, p<0.001		-4.60%, p<0.001		-18.40%, p<0.001	
		3v4		-3.37%, p=0.003		-2.54%, p<0.001		3.47%, p=0.345	

Table 5 presents overall Part A results, averaged by year of study, across universities and states. The mean knowledge score on this part of the survey was 58.6% (EM mean 60.1%), significantly less than 70% (t_{565}=-23.90, p<0.001), with some variability across year levels and universities. Mean knowledge scores were significantly <70% both overall and across year levels.

Mean scores according to study year for each topic within Part A are given in Figure 10. Mean scores were generally lowest for risk factor questions. Excepting fourth year students, knowledge about the issue/cost associated with falls was highest. Fourth year students appeared to know most about exercise interventions. For this topic, knowledge scores were significantly <70% overall. Whilst the second and third year scores were significantly <70%, the fourth year knowledge scores regarding interventions did not significantly differ from 70%.

University and year of study comparisons by Part A topic areas are in Table 6. In all cases, second year students had significantly poorer knowledge than both third and fourth year students. Despite lower knowledge levels than fourth year students for each topic, third year students only had significantly reduced knowledge about interventions.

The mean knowledge score for Part B (Table 5) was 61.8% (EM 62.7%) and significantly <70% (t_{566}=-28.25, p<0.001). Knowledge scores were significantly <70% in all students, irrespective of year of study. The mean knowledge score on Part C (Table 5) was 58.6% (EM mean 63.8%) and significantly <70% (t_{565}=-8.68, p<0.001). Second year students had knowledge scores that were significantly <70%, but third and fourth year knowledge scores were not significantly different to 70%.

Figure 10 Comparison of student's knowledge across year levels in relation to sub-components of knowledge assessment (estimated marginal mean±SEM

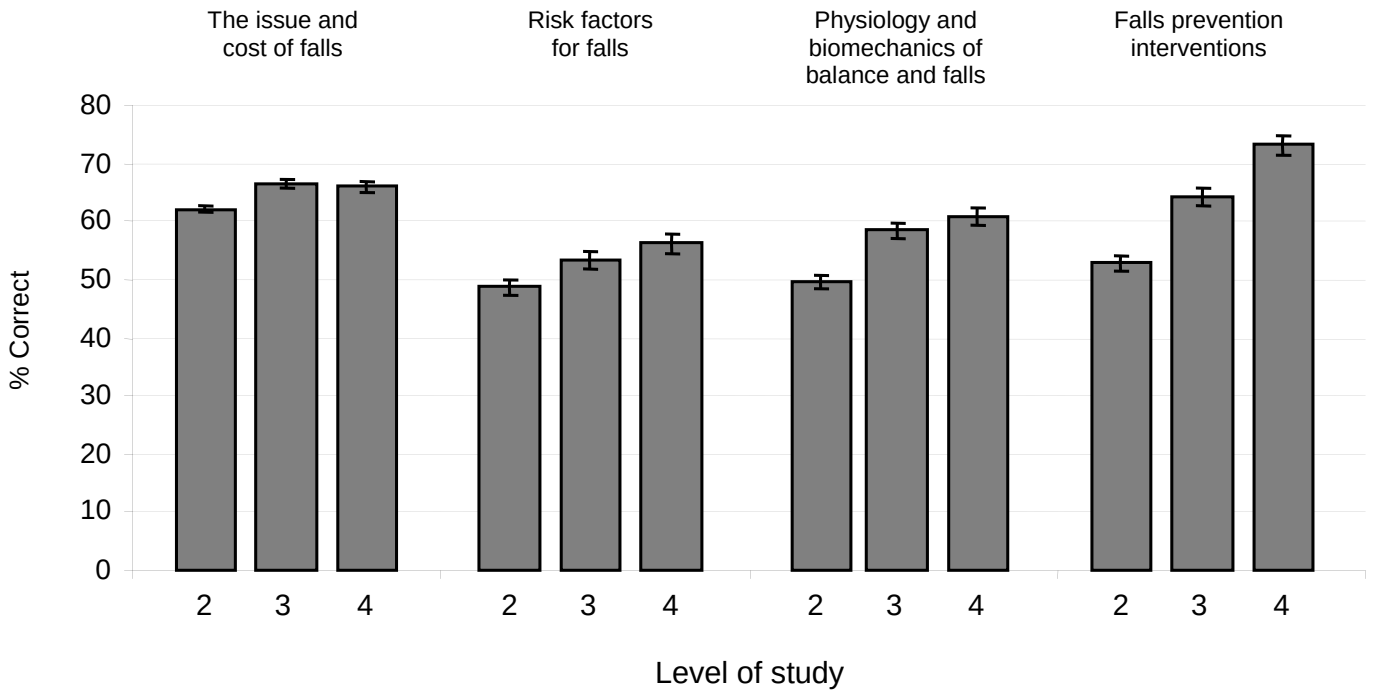

Table 6 Impact of year level on knowledge about specific issues

Knowledge topic area	Mean % correct score	Year of study effect
Issue/cost of falls	64.6 (SEM 0.4)%	$\chi^2_{(2,n=566)}$=22.89, p<0.001 • second < third (mean difference 4.23%, p<0.001) • second < fourth (mean difference 3.80%, p=0.001).
Risk factors	52.6 (SEM 0.9)%	$\chi^2_{(2,n=566)}$=16.25, p<0.001 • second < third (mean difference 4.25%, p=0.024) • second < fourth (mean difference 8.08%, p<0.001) years
Physiology/biomechanics	56.6 (SEM 0.8)%	$\chi^2_{(2,n=566)}$=44.35, *p*<0.001 • second < third (mean difference 8.82%, p<0.001) • second < fourth (mean difference 11.39%, p<0.001*)*.
Interventions	63.1 (SEM 0.9)%	$\chi^2_{(2,n=566)}$=98.38, *p*<0.001, • second < third (mean difference 11.33%, *p*<0.001) • second < fourth (mean difference 20.82%, *p*<0.001) • third < fourth (mean difference 9.49%, *p*<0.001).

Discussion

Population-wide delivery of exercise prescription for falls prevention in older people requires an adequately trained and expert workforce. This study has assessed the knowledge standards of current exercise science students, as future exercise professionals, from a cross-section of Australian universities. The survey was conducted towards the end of the calendar

year so the reported knowledge can be taken as a fair representation of that attained by the second, third and fourth (graduating) years. Average level of knowledge was found to be significantly less than 70%. This criterion, although somewhat arbitrary, reflects the cut-point for a distinction grade at universities and was considered to be the minimum standard necessary for exercise prescription experts. The findings suggest that exercise science students do not graduate with sufficient knowledge regarding falls and the prescription of exercise for falls prevention.

Students with more years of study had significantly higher scores indicating that knowledge regarding falls and exercise for falls prevention improves with the length of university tuition. Despite this, fourth year students still only scored an average of 65% in Part A and B. This indicates a need for curriculum development, across all undergraduate years, to improve the knowledge base regarding falls in older people so that upon graduation, exercise science students are well-placed to provide specialised exercise services for falls prevention in older adults.

There was some variation in test performances across topics, but all were significantly below the desired 70% benchmark. Students performed worst in questions related to risk factors for falls. A systematic review concluded that the prevention of falls in older adults could be maximised by interventions that target multiple risk factors in individuals.[70] In this context, exercise professionals need to appreciate which risk factors are amenable to exercise intervention and how to tailor exercise accordingly.[155-157] Our findings suggest a need for improved education regarding medical, sensory, neuromuscular, psychosocial, environmental and demographic factors that increase the likelihood of a fall.

Knowledge about the physiology and biomechanics of balance and falls was also relatively deficient. It is widely accepted that poor balance is a significant contributor to falls in older people[158] and that balance training can help prevent falls.[49] It is important that exercise

professionals working with older populations understand how age manifests in sensorimotor performance before prescribing exercise.[71] Furthermore, an understanding of the various mechanical factors that challenge balance and influence balance recovery (for example, the required joint torques necessary for effective trip recovery) is necessary for the identification of appropriate exercise.[159] Average scores on items relating to the progression of exercises were also significantly below the 70% benchmark. Prescribing appropriately graduated balance exercise, in particular, is crucial to the success of exercise interventions for falls prevention.[49]

There were several limitations of this study. The survey assessed students' knowledge about falls prevention and not specific skills in prescribing exercise. Future assessments should consider practical skills development as well as knowledge levels. Similarly, scores on surveys such as this can reflect both knowledge levels and the difficulty of the questions. We aimed to develop a survey that was not too difficult and reflected required knowledge levels corresponding to an expert with responsibility for prescribing exercise for older people.

Some of the survey questions may have been unintentionally leading or led students to anticipate some answers. We were unable to assess the extent, if any, of these biases. However, the fact that mean knowledge scores were below the 70% benchmark suggests that this is not a major bias.

We aimed to recruit a representative sample of students in second, third and fourth years of exercise science degrees, in urban and regional universities across two Australian states. Given that the sampled universities were the major institutes offering exercise science degrees in the two states, we have assumed that these findings are representative of all exercise science students. While it was not the purpose of this study to compare universities, a difference of only 8% separated the mean scores for the poorest (mean 56% correct) and best performing universities (mean 64% correct) for Part A. We did not assess the curriculum

content at the participating universities but anecdotal evidence suggests little focus specifically on falls prevention.

Notwithstanding these limitations, the relatively low observed knowledge levels suggest a need to specifically target the education of future exercise professionals. A focussed approach aimed at systematically educating a whole workforce through the university sector has the potential to be the most effective and sustainable. To ensure that exercise professionals are prepared to take a lead role in providing exercise programs for older adults, university course content must include the latest falls prevention evidence. This may require a shift in teaching direction for many universities from the historical focus of improving elite sport performance or enhancing the health and fitness of predominantly healthy younger populations, but one that reflects an important need in the community.

Future falls prevention at the population level will require a critical mass of clinical champions to implement interventions shown to be efficacious.[90] There is a clear role for exercise professionals to contribute to population-level falls prevention initiatives by taking on this role.[6] However, to achieve this they must have minimum requisite knowledge to ensure they are equipped to prescribe suitable and effective exercises for falls prevention in older people. Future workforce development could be achieved through the provision of new workforce learning, external courses and professional development opportunities, including teaching into undergraduate and post graduate university courses. Importantly, curricula targeting exercise professionals should extend current physiology, biomechanics and exercise prescription content to focus on the impact of ageing on functional fitness and targeting exercise prescription for reducing falls risk. With improved training in this area, these professionals will be well placed to provide evidence-based exercise services for older adults, and importantly, for falls prevention.

In conclusion, this study highlights the need for the development and widespread implementation of an evidence-based “exercise for falls prevention” curriculum for future exercise professionals. Adoption of such a curriculum would improve workforce capacity for falls prevention in a matter of a few years. Increased delivery of appropriately targeted exercise programs to older people will reduce their risk of falling, reduce their risk of fall-related injury and improve their general quality of life by improving functional capabilities. In doing so, exercise professionals will collectively make a significant contribution to improving long-term public health.

Chapter 6
Development, implementation and evaluation of a university-based falls prevention education program (UniFPEP)

The contents of this chapter formed the basis of the final report submitted to the Commonwealth Department of Health and Ageing and includes the results for the students' practical skills, levels of confidence and full evaluation of the university-based falls prevention exercise program (UniFPEP). The knowledge outcomes and retention of knowledge results are presented in Chapter 7.

Finch C, Lord S, Close J, **Pascoe D**, Sturnieks D, Tiedemann A, Twomey D. Development of a workforce education program for exercise practitioners in falls prevention and exercise prescription for older people. 2007-2008. Falls Prevention and Injury Prevention Community Grants Program, Commonwealth Department of Health & Ageing.

Introduction

The content and development of the university-based falls prevention education program (UniFPEP) was informed by the results of the workforce scoping survey (Chapter 5) and was designed to improve the knowledge base of undergraduate and postgraduate exercise science and exercise rehabilitation students. Gaps in the current undergraduate and postgraduate students' knowledge of falls risk, methods to prevent falls and perceived ability to deliver a falls prevention exercise program were identified. Knowledge areas with less than 80% of correct/adequate responses in the workforce scoping survey were specifically targeted for development of a new curriculum in falls prevention.

The fundamental tenet behind the development of the UniFPEP was that students need to be equipped with evidence-based information, including the social and economic impact of falls, risk factors for falls, physiological consequences of ageing, biomechanical and physiological principles of balance, targeted exercise prescription and effective falls prevention strategies. The students' prerequisite knowledge of the principles of exercise prescription needed to be enhanced in relation to the special needs of older adults and at-risk populations (see Chapter 5). Students were specifically guided to develop safe and efficacious community-based exercise programs for older adults designed to maximise uptake and adherence of exercise in those populations who stand to benefit most.

Development of the UniFPEP involved the preparation of teaching and learning resource materials to enhance learning beyond current levels by translating the latest research evidence regarding falls risk and exercises for falls prevention to produce a discipline leading curriculum. The curriculum included resources to support a mixed delivery of face to face and online lectures, tutorials, practical laboratory sessions, reading materials and assessment tasks.

Six curriculum modules were developed in the following areas:

1. Epidemiology and physiology of falls
2. The biomechanics of balance and gait
3. Risk factors and risk assessment
4. Research and exercise for falls prevention
5. Exercise prescription for falls prevention
6. Exercise prescription for falls prevention – program management and practical application

The UniFPEP Curriculum

The UniFPEP curriculum was designed to enhance students' learning outcomes through the provision of online lectures and learning materials via a web-based learning platform (Blackboard) to supplement and strengthen the delivery of face-to-face lectures, practical classes and self-directed learning tasks. All class content and resources were provided in a hardcopy format to ensure students could access all resources and employ individual learning strategies to assimilate current evidence based falls prevention information during classes and provide them with a tangible resource for the future. Through structured learning tasks using a number of different learning formats an strategies,[69] students were provided with the opportunity to acquire the knowledge and ability to identify, develop, demonstrate and implement evidence-based exercise interventions designed to enhance physical and functional capacity to prevent falls and fall related injury in older people.

The UniFPEP was developed as two different, but overlapping, curricula to better meet the learning outcomes of two specific student cohorts. A six-hour (2 hours per week) format was prepared for third year exercise science students which included five lecture/tutorials and three laboratory/practical classes. A nine-hour (3 hours per week) format was developed for the fourth year (post-graduate) level students which incorporated all teaching and learning resources from the six hour format with higher level content and learning tasks to augment

and expand exercise program design for high risk populations and program management skills. The overall plan of the UniFPEP was to implement and evaluate the six-hour format with third year Human Movement students studying exercise science with a minor in exercise rehabilitation and the nine-hour format with the fourth year Graduate Diploma of Exercise Rehabilitation students. The nine-hour format was prepared as six lecture/tutorials and four laboratory/practical classes. The specific learning objectives for each component module are provided in Appendix 5A. Supporting material provided with each lecture included, recommended reading tasks and a take-home 10-item written quiz to allow students to self-assess their individual progress and guide their study accordingly. Knowledge gain in relation to the formal content and planned learning outcomes of the UniFPEP was examinable for all third and fourth year students on completion of each respective curriculum format with student test results forming part of the evaluation of the knowledge gains for the UniFPEP curricula.

Implementation of the UniFPEP

The UniFPEP was delivered within the School of Human Movement and Sport Sciences (HMSS) at the University of Ballarat over a three week period, during six or nine hours of face-to-face contact for third year undergraduate and fourth year post-graduate level students, respectively. The six modules of the UniFPEP curricula were delivered during weeks two to four of Teaching Period 1, 2008 (3 – 21 March) and were substituted directly for part of the usual curriculum in specifically identified courses within the undergraduate Human Movement (third year) and Graduate Diploma in Exercise Rehabilitation (fourth year) programs. Students undertaking the exercise science major with the exercise rehabilitation minor (third year) completed the six-hour module as part of the course, HM635 – Foundations of Exercise Rehabilitation. Those students completing the Graduate Diploma in Exercise Rehabilitation completed the extended nine-hour module during PH452 – Introduction to Exercise Rehabilitation.

The blended delivery mode for the education modules enabled the UniFPEP curricula to be directly substituted into the School of HMSS usual timetable delivery format for both courses. This format allowed a mix of theory-based lectures, group-based tutorials and applied practical laboratories. The imposed format allowed students to be introduced to the theoretical components of falls prevention and to have the opportunity to apply newly acquired knowledge and practical exercise prescription skills aimed at preventing the risk of falls.

The curriculum modules were delivered in the format of separate learning topics or components to best suit the allocated time structure and format of the University of Ballarat timetable. The schedule of delivery plan for the modules is presented in Appendix 5B. The author of this thesis was responsible for delivering two hours of the six-hour format and five hours of the nine-hour format. Dr Daina Sturnieks (Prince of Wales Medical Research Institute) delivered the first four hours of each format.

Methods of evaluation

Whilst the overall development and evaluation of the UniFPEP was contextualised within a health promotion capacity-building framework,[67] the UniFPEP was fundamentally an education program that required evaluation within an education/training context. Students' reaction to the module and their learning outcomes were evaluated using the first two levels of Kirkpatrick's four levels of evaluating training programs.[72] Combining Kirkpatrick's evaluation framework with accepted and commonly used health promotion evaluation techniques[147] allowed each phase of the evaluation process to be customised to ensure that detailed feedback was received from all students regarding their reaction to, and learning outcomes from, participation in both formats of the UniFPEP.

As described in Chapters 1 and 4 of this thesis, the four levels of Kirkpatrick's model for evaluating training programs, in sequential order are *reaction, learning, behaviour* and

results.[72] The evaluation of *reaction* involved measuring how students who participated in the module reacted to it. This was achieved using 'Likert' rating scales and by asking students to complete feedback questionnaires and provide specific feedback, suggestions and comments to direct development of the curriculum for future delivery of the education modules. Although a positive reaction does not necessarily ensure learning, it was expected that if participants reacted favourably to the UniFPEP they would be more motivated to learn.[160]

Assessment of *learning* was achieved by measuring how students' knowledge changed and skills developed after participation in the UniFPEP. Evaluation within this level was accomplished by class tests and quizzes to determine knowledge gains between pre and post participation, while observation of and demonstrations by students were used to determine improvements in skill development. Questionnaires were completed to determine attitude change (*reaction*) following participation in the UniFPEP. Changes in one or more of knowledge, skills and/or attitude must take place if change in behaviour is going to occur.[72] Assessment of behaviour change (*behaviour*) for this student cohort and the impact on patient outcomes (*results*) was beyond the scope of this study.

Assessment of knowledge gain and confidence

Immediately prior to the implementation of the UniFPEP, a modified version of the workforce scoping survey used in Chapter 5 was administered to the participating third year Human Movement and fourth year Graduate Diploma students in HMSS. The modified UniFPEP survey (Appendix 5C) enabled the knowledge evaluation component to be more directly applicable to the lecture content that was delivered. The UniFPEP survey was administered during the first week of classes in Teaching Period 1 2008 (25 - 29 February). The UniFPEP survey, in the form of a questionnaire, was given to students immediately prior to delivery of the UniFPEP curricula to assess their baseline knowledge, awareness in relation to falls and falls injuries, their prevention, the specific role of exercise prescription for falls prevention and the students' confidence in prescribing exercise for older people and falls prevention. The

questionnaire used a range of multiple choice, open-ended response questions and Likert rating scales and was structured to relate directly to the six module components of the UniFPEP.

An identical survey was given to the students after they had completed the UniFPEP to identify changes in knowledge and confidence in prescribing exercise for older people and falls prevention. To enable matching and allow direct comparisons to be made of pre and post UniFPEP knowledge and confidence scores, the surveys requested student identification numbers, but no other identifying information.

The responses to all questions were coded prior to data entry. All data was then double entered and cleaned before analysis. Statistical analysis using SPSS 15.0 for Windows (SPSS Inc, Chicago, USA) compared the level of correct responses. One-sided McNemar tests were applied overall and on a question-by-question basis for the comparison of paired proportions. The analyses were also stratified for year of study of the students (i.e. third and fourth year students were analysed separately). The analysis took the paired (pre-post UniFPEP delivery) nature of the data into account. (Complete results of knowledge outcomes and retention are presented in full in Chapter 7).

The UniFPEP was implemented in one third year and one fourth year class which represented 100% of the teaching opportunities for the 2008 cohort of students at the University of Ballarat. Even though the pre and post knowledge and confidence assessments were completed by 100% of the students attending the relevant class at the time of administration, not all students completed both the pre and post assessments. Because the evaluation aimed to detect changes in knowledge and confidence, only assessments that could be accurately paired pre and post were included in the final UniFPEP results.

Confidence in prescribing exercise

The pre and post UniFPEP surveys included two questions that rated students' self-reported confidence in prescribing exercises for the elderly and exercise for falls prevention. Both questions were scored on an 11-point Likert scale (0 – 10, 0 having no confidence and 10 maximum confidence) with mean scores compared pre and post. The pre and post data were analysed using a paired t-test with 95% confidence intervals. The analyses were based on the 51 students with data for both pre and post assessments.

Assessment of practical skills development

Practical skills for all students were assessed using a requirement for students to develop and demonstrate a set of prescribed exercises which addressed the following elements of exercise prescription for falls prevention: balance and mobility training; strength; gait; balance and reaction time; functional activities; dual tasks; group exercise and agility training. This assessable learning task was presented to the class in a group setting and students were graded on the suitability of their program. Students were given an assessment criteria sheet (Exercise for Falls Prevention – Laboratory) against which their ability to explain and demonstrate exercises, exercise selection, ability to identify and make adjustments to participant's exercise technique and ability to progress exercises suitable for a falls prevention exercise program were assessed (Appendix 5D). In addition, the fourth year students were also assessed on their ability to prepare and conduct a targeted falls prevention class for an 'at risk' participant group. Students were assessed on their ability to present a program which addressed the needs of an older age group with a number of comorbidities and health concerns such as, osteoarthritis, knee and hip arthroplasties, diabetes, hypertension, neurological disorders, short term memory loss and visual and auditory impairments. They assessed on their ability to present a targeted falls prevention program, their ability to modify and progress or regress exercises, manage individual needs within the group, ensure the safety of all participants (Appendix 5E)

Both assessment criteria sheets used a 6-point assessment scale (0 – 5, 0 - did not perform to 5 – performed to an excellent standard) to determine if each skill/task was completed and how well each was performed. This was a standard method of evaluating student practical skills within HMSS courses at the University of Ballarat.

Formal UniFPEP feedback

In addition to the evaluation of knowledge gain, confidence and practical skills development, formal course evaluations were also undertaken. The course evaluations were based on level one of Kirkpatrick's[72] four levels of evaluation and sought feedback from the students on the quality of the delivered material and resources, perceived relevance of the program to their future ongoing practice and an assessment of other delivery factors.

Level one of Kirkpatrick's four levels[72] of evaluating training programs, relates to the students' overall *reaction* to the UniFPEP, or how the students felt about the learning experience. *Reaction* to the UniFPEP was evaluated using a 10-point Llikert scale from one to ten (1 – very poor learning experience, 10 – extremely valuable / enjoyable learning experience). Students were given a set of 21 questions (23 questions for Year 4) to evaluate the program. Analysis was based on the mean score for each question. This type of Likert scale evaluation is used as standard practice at University of Ballarat for course evaluations, with a score of 3.5 or above on a 5 point scale (translated to a score of 7 or more out of 10) indicating a well-delivered course. Copies of both sets of questions used for the evaluation of the student reaction are provided in (Appendices 5F and 5G).

For the purpose of analysis, the data from two questions regarding the quality of lecturing were pooled, to gain an overall value for lecturing quality. For the purpose of feedback, the results of these two questions were given individually as feedback to both lecturers. One-sided t-tests were conducted to test the hypothesis that the mean score (for a given question) exceeded seven because it was expected that the UniFPEP would be well received. Using the University

of Ballarat ranking scheme, a mean score exceeding 7 is taken to indicate a good aspect of the course and a mean score of 9 to indicate an excellent or outstanding course approval rating. The exception to this was question 14, which asked students to rank the ease of the material from too easy to too hard. For this question, a mid point score was more appropriate so a two-sided t-test of the hypotheses that the mean score was not equal to 5 (the mid-point) was conducted.

Students were also asked to provide specific feedback on the positive and negative aspects of the course and to make any recommendations for how it might be improved. The principles of health promotion evaluation proposed by Hawe, Degeling and Hall[147] were adopted to evaluate level one of the Kirkpatrick model. This allowed the evaluation to be more impartial so that participants were more likely to feel comfortable about giving negative and positive feedback, coupled with an opportunity to turn any criticism of the program into a recommendation, or constructive feedback. This format also helped preserve anonymity by allowing each participant to complete the task or in groups where individuals were able to pool their answers onto a group feedback sheet. Groups of 2-4 students provided this information in the form of open-ended text responses. The group consensus sheets were collated and summarised and presented as feedback for the program (Appendix 5H). The evaluation of the UniFPEP was undertaken immediately following the two or three week implementation period. The overall plan for evaluating the UniFPEP and all measures used in evaluating the process, impact and outcomes of the UniFPEP are included in Appendix 5I.

Results

Complete results of knowledge outcomes and retention are presented in full in Chapter 7.

Change in confidence in prescribing exercise

There was a significant increase in the students' self-rating of confidence with exercise prescription after the UniFPEP compared to baseline with the levels of change in confidence being most marked for exercise prescription for falls prevention (Tables 7 & 8). Confidence increases were generally larger for third year than fourth year students, but were not statistically different. A very small number of students appeared to have become less confident. However, as the format of the question did not specifically state whether low or high scores were more indicative or more (or less) confidence, these students may have interpreted the scale differently to the other students.

Table 7 Comparisons of the self-reported confidence at prescribing exercises for older people

Test period	Statistic	All	Third year Students	Fourth year Students
n		**51**	**31**	**20**
PRE	**Mean**	4.6	4.23	5.1
	Median	5.0	4.0	5.5
	Min	0	0	2
	Max	8	8	8
POST	**Mean**	6.9	7.0	6.8
	Median	7.0	7.0	7.0
	Min	4	4	4
	Max	10	10	8
DIFFERENCE	**Mean** (95% CI)	2.4 (1.84-2.87)	2.8 (2.11-3.50)	1.7 (0.93-2.37)
	Median	2.0	2.0	1.5
	Min	-1	-1	-1
	Max	7	7	5

Table 8 Comparisons of the self-reported confidence at prescribing exercises for falls prevention

Test period	Statistic	All	Third year Students	Fourth year Students
n		**51**	**31**	**20**
PRE	**Mean**	4.0	3.6	4.7
	Median	4.0	3.0	4.0
	Min	0	0	20
	Max	9	9	7
POST	**Mean**	7.0	7.2	6.8
	Median	7.0	7.0	7.0
	Min	4	4	4
	Max	10	10	9
DIFFERENCE	**Mean** (95% CI)	3.0 (2.49-3.59)	3.7 (2.98-4.31)	2.1 (1.24-2.96)
	Median	3.0	4.0	2.0
	Min	-1	1	-1
	Max	8	8	6

Practical skills assessment

Table 9 summarises the assessment of student practical skills and assessment shows that the mean scores were very good to excellent. The timetabled laboratory sessions allowed testing of students' ability to apply their theoretical knowledge in the planning of an appropriately targeted progressive exercise program for older people. Fourth year students were also assessed on their ability to design a program that considered older people's co-morbidities and broader range of abilities. The fourth year students were also required to deliver the program to a group of their peers.

Table 9 Results for the assessment of students' practical skills development

	Mean rating of third year students	Mean rating of fourth year students
Laboratory session – planning of a progressive exercise program for older people	4.0	4.2
Class format – planning and delivering exercise programs for older people with a range of co-morbidities and ranges of ability	n/a	4.4

Note: Ratings were on a five-point scale of 1 - 5, with higher scores indicating greater skill

The results of the practical skills assessment demonstrated a very good level of skill and application of knowledge with regards to exercise prescription for falls prevention. Students demonstrated the ability to target the appropriate types of evidence-based exercises to prevent falls in older people. All students could select an appropriate range and mix of exercises to enhance balance, strength, gait, dual tasking and functional abilities (mean = 4.5: CI 4.2 – 4.7). The majority of students were able to plan a progressive approach to each type of exercise and demonstrated a high level of awareness of the importance of safety and technique when introducing and supervising exercise performance (mean = 4.4: CI 4.1 – 4.7).

All fourth year students demonstrated a high level of ability to plan a comprehensive falls prevention exercise class and were capable of planning a range of exercises and activities to meet the needs of a range of abilities and medical conditions (mean = 4.3 CI 4.1 – 4.9). Although all students showed a high level of ability in exercise prescription, the fourth year students demonstrated a higher level of knowledge and skill (mean = 4.4: CI 3.8 – 5.0) than third year students (mean = 4.1: CI 3.4 – 4.7) in general exercise prescription and the ability to progress each exercise and activity to meet the specific needs of a group with a range of

abilities. This higher level of skills and knowledge would be expected at the fourth year level, as these students are completing study to be eligible for accreditation as an EP whose primary role is exercise prescription for people with chronic and complex medical conditions.[61]

Formal feedback for UniFPEP

Table 10 summarises the mean scores for each component and the p-value of the hypothesis to test that the mean score was more than 70%, indicating a well-delivered program. Overall, the mean scores indicated that the course was very well received by the students. Twelve of the mean evaluation scores were between 7 and 8 and a further nine exceeded 8 on a 10-point Likert scale (1 to 10). The mean score was significantly greater than 7 for all components, except for Question 10: interesting lectures (even though this rating was still over 7). The mean score on Question 14 regarding the level of material showed that the students did not find the material too easy and that it was a little challenging for them. Tables 11 and 12 summarises the findings for the third year and fourth year students respectively.

Table 10 Student ratings of the content and delivery of the UniFPEP (all students)

	No. of students	mean score	SE (mean)	p-value of one-sided test of mean > 7 (unless indicated)
Q1 Module 1	55	7.6	0.13	<0.001
Q2 Module 2	55	7.5	0.19	0.032
Q3 Module 3	55	7.6	0.18	0.004
Q4 Module 4	55	7.6	0.17	0.003
Q5 Module 5	55	8.6	0.16	<0.001
Q6 Module 6	20	8.6	0.26	<0.001
Q7 Enjoyment of program	55	7.9	0.18	<0.001
Q8 Satisfaction with lecture content	55	8.1	0.17	<0.001
Q9 Relevance of lab tasks	55	8.7	0.13	<0.001
Q10 Interesting lectures	55	7.3	0.20	2.46
Q11 Interesting labs	55	8.4	0.14	<0.001
Q12 PowerPoint slides	55	7.6	0.19	0.004
Q13 Pace of classes	49	7.8	0.18	<0.001
Q14 Level of material	49	5.5	0.17	<0.001 *(two-sided test of mean ≠ 5)*
Q15 Depth of material for learning and future use	48	7.7	0.17	0.001
Q16 Usefulness of handout materials	49	7.7	0.19	0.001
Q17 Use/value of quizzes	19	7.8	0.30	0.023
Q18/Q19 Combined lecturer assessment	98	8.3	0.10	<0.001
Q20 Relevance to future	49	8.0	0.24	<0.001
Q21 Balance between presentation and group involvement	49	8.0	0.15	<0.001
Q22 Rating as education to help future job	49	8.1	0.19	<0.001
Q23 Overall rating of falls prevention program	49	8.1	0.16	<0.001

Table 11 Third year student ratings of the content and delivery of the UniFPEP

	No. of students	mean score	SE (mean)	p-value of one-sided test of mean > 7 (unless indicated)
Q1 Module 1	33	7.6	0.17	0.005
Q2 Module 2	33	7.5	0.26	0.183
Q3 Module 3	33	7.5	0.16	0.009
Q4 Module 4	33	7.6	0.14	0.000
Q5 Module 5	33	8.6	0.19	0.000
Q6 Module 6	0	n/a		
Q7 Enjoyment of program	33	8.1	0.24	0.000
Q8 Satisfaction with lecture content	33	8.2	0.22	0.000
Q9 Relevance of lab tasks	33	8.8	0.17	0.000
Q10 Interesting lectures	33	7.3	0.26	0.418
Q11 Interesting labs	33	8.5	0.19	0.000
Q12 PowerPoint slides	33	7.5	0.24	0.063
Q13 Pace of classes	33	7.9	0.23	0.001
Q14 Level of material	28	5.4	0.33	<0.044 *(two-sided test of mean ≠ 5)*
Q15 Depth of material for learning and future use	27	7.4	0.19	0.133
Q16 Usefulness of handout materials	28	7.5	0.19	0.159
Q17 Use/value of quizzes	0	n/a		
Q18/Q19 Combined lecturer assessment	28	8.0	0.17	0.000
Q20 Relevance to future	28	7.6	0.34	0.214
Q21 Balance between presentation and group involvement	28	7.8	0,16	0.000
Q22 Rating as education to help future job	28	7.9	0.29	0.006
Q23 Overall rating of falls prevention program	28	8.2	0.21	0.000

Table 12 Fourth year student ratings of the content and delivery of the UniFPEP

	No. of students	mean score	SE (mean)	p-value of one-sided test of mean > 7 (unless indicated)
Q1 Module 1	22	7.6	0.21	0.014
Q2 Module 2	22	7.5	0.28	0.171
Q3 Module 3	22	7.7	0.37	0.166
Q4 Module 4	22	7.6	0.38	0.324
Q5 Module 5	22	8.5	0.28	0.000
Q6 Module 6	20	8.6	0.26	0.000
Q7 Enjoyment of program	22	7.5	0.24	0.106
Q8 Satisfaction with lecture content	22	7.9	0.29	0.009
Q9 Relevance of lab tasks	22	8.5	0.19	0.000
Q10 Interesting lectures	22	7.3	0.31	0.778
Q11 Interesting labs	22	8,2	0.19	0.000
Q12 PowerPoint slides	22	7.7	0.30	0.054
Q13 Pace of classes	20	7.6	0.27	0.072
Q14 Level of material	21	5.7	0.33	*0.044 (two-sided test of mean ≠ 5)*
Q15 Depth of material for learning and future use	21	8.0	0.30	0.007
Q16 Usefulness of handout materials	21	8.1	0.25	0.001
Q17 Use/value of quizzes	19	7.8	0.30	0.023
Q18/Q19 Combined lecturer assessment	21	7.5	0.25	0.106
Q20 Relevance to future	21	8.6	0.27	0.000
Q21 Balance between presentation and group involvement	21	7.9	0.28	0.009
Q22 Rating as education to help future job	21	8.3	0.24	0/000
Q23 Overall rating of falls prevention program	21	8.1	0.25	0.001

In addition to the formal course evaluation, students were also invited to provide additional written feedback on the course. Tables 13 – 15 for third year students and Tables 16 - 18 for fourth year students. The responses are shown in separate tables for the positive comments, negative comments and suggestions for improvements. The UniFPEP was generally well received by students, with relatively few suggestions for how it could be improved.

The results of the course evaluations and feedback suggest that the students viewed the practical and laboratory-based activities as very important components of that teaching and learning program. Therefore, if the curriculum was delivered via an online format it would be highly desirable to use the developed materials in conjunction with some face-to-face or applied hands-on learning. Nonetheless, it would also be desirable for any student who requires practical exercise prescription skills to have the opportunity to increase their confidence through the practical application of their new knowledge. The application of skills could be further enhanced by bringing students together to participate in laboratory and hands-on applied sessions, which include delivery of exercise prescription programs to older people, organised by the course coordinator or lecturer. Also, the inclusion of appropriate video material, particularly of older people being assessed for falls risk or participating in prescribed exercise, should be an integral part of any class or online delivery format of the curriculum.

Student comments regarding the pace of lectures being too fast may reflect the large amount of new information in some topic areas and formal and content of individual slides. This could be overcome by integrating a greater proportion of web-based material or by breaking the topics down further, into clearly separated topics, and allowing the course to be delivered over a more flexible time period rather than being dictated by the week to week university course structure and timetable.

Table 13 Positive comments received from third year student groups about the various module delivery components

Content	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment	Other
Really good, extensive thorough	Knowledgeable Approachable Thorough	Interesting	Comprehensive	Fun Interactive	Fun	Good Broad Innovative	Passion Enthusiasm of lecturers came through
Good depth		Good	Good	Last one was best		Great	
Appropriate Easy to listen and understand	Easy to listen Clear organised	Well constructed Easy to read	Good	Fun and informative	Good	Fun Colourful Playful	
Informative Good ideas Increased imagination	Clear, easy to follow	Informative, easy to follow, no information overload	Good	Interesting, fun, hands on	Good	Fun	
Pretty broad	Knew what they were talking about			Good when we got the balls and gear out	-	Good fun	Appropriate to test modules
Useful	Good	Clear	Easy to understand	Useful and fun	Fun	Fun	
	Excellent						All content was great and helped a lot with learning
Appropriate						Good	
Useful	Useful	Useful	Useful	Useful	Useful	Useful	Useful
	Made it interesting			Good fun and informative		Good variety	

Each row represents feedback from a different group of students

Table 14 Negative comments received from third year student groups about the various module delivery components

Content	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment	Other
Short period of time to cover it	Sometimes spoke quickly	Difficult to read back because of white text Difficult to interpret	Given too quickly Questions often not answered	Busy – too much a little bit too quick			
	Went through some topics a bit quick	Diagrams hard to read		Biomechanics was a bit boring	Testing one was a bit boring		
Pretty boring	Again a bit dry	A bit dry	A bit dry	A bit dry			
	Too many random stories	Too basic	Went over material already covered – biomech and physiol	Already used force plate and gait mat			

Each row represents feedback from a different group of students

Table 15 Recommendations for improvement received from third year students about the various module delivery components

Content	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment	Other
Not sure if that can be addressed (referring to above negative comment I think)	Use a 'mike' (microphone)			Maybe for 3 hours every second week			
	Maybe a week longer				Class size was massive for the negative	Get more	More time experiment in biomech lab
		More funny footage					
	Show us more exercises instead of just leaving it up to us to come up with some						

Each row represents feedback from a different group of students

Table 16 Positive comments received from fourth year students about the various module delivery components

Contents	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment	Other
Relevant	Very simple and easy to follow			Really good. Very appropriate and specific to us	Practical component was great Putting theory straight into practice	Always good to move and play	
Holistic	Enthusiastic	Appropriate topics / headings were highlighted well	Full and informative	Fun and interesting	Good variation		
Thorough	Easy to understand	Clear, colourful, good effects	As previous	Fun, practical, good for learning	Feedback good, class interaction, new friends	Appropriate and at time	
	Good		Good to understand what works and what doesn't, i.e. spectacles		Good to practice what we learn	Shows what you can use even if you don't have anything	Good that lecture notes were provided
Useful for future jobs	Clear (speaking) interactive	Pictures and tables were good	Good that we were tested on it - valid	Fun and interactive	Good to be able to apply information	Good to be exposed as had never seen it	
Valuable	Enthusiastic	Clear, precise		Interesting, fun	Interesting, cohesive, good	Amazing, interesting	

Each row represents feedback from a different group of students

Table 17 Negative comments received from fourth year students about the various module delivery components

Contents	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment	Other
A bit spread out. Can't remember everything		A little too much writing	Too much research information. Just big slabs			Was it relevant for what we use it?	
Overwhelming More examples of exercises prescription	Could be more interactive during lecture	Incorporate pictures to make viewing more inviting and better understanding	Information overload	Groups too big, limited time	Not enough direction		
Tedious overload	Overload – too much information	Monotonous – need more pictures	As previous			Could have actually done exercises	
Sometimes confusing research presented		Sometimes bland, long-winded sometimes					
Lots to take in	Felt rushed at times	Some slides had too much information on them		Needed more time to play	Rushed activities		
Bland		All very similar looking	Long	Not much time			

Each row represents feedback from a different group of students

Table 18 Recommendations for improvement received from fourth year students about the various module delivery components

Content	Teaching	PowerPoint presentations	Lecture Content	Laboratory activities	Group activities	Equipment
More of workshop			Need to be summarised	Spend more time here Provide a resource book. Pictures and explanations of tests and some exercises		Try and make more connection or use tests that we would use. The pen on paper was a good one. Instead of quizzes maybe do a scenario or case studies to make us think and retain information better. Especially towards exercise prescription. We got more out of exercise prescription part because of our course for next time problem focus a little more on that.
Even out time between lecture material and practical time			Understand findings but would have preferred more Exercise Physiologist related exercise prescription ideas			
Use videos. Bring in old people – real life situations	Give us some resources i.e. list of exercises	U-tube		Have more outside laboratories and less lectures		Used the equipment not just talked about them
				Need more time on the practical side. Put the theory into practice		

Spaced out or less content on slides	Allow more time to teach important points	In general they were good			More time needed	
Make more interesting – less stats		A bit of variety in appearance between modules	More breaks	More time for lab activities	Should be more of group activities	

Each row represents feedback from a different group of students

Whilst both third and fourth year students reportedly enjoyed the course, the fourth year students had a greater appreciation of its relevance to their future practice. This is perhaps not surprising, since the fourth year students had purposefully chosen to undertake a further year of study in a professionally orientated program, specifically aimed at enhancing their exercise prescription and professional skills application to the level of professional accreditation standards.[62] However, it is recommended that future iterations of the six-hour UniFPEP format include greater application tasks to enhance appreciation and relevance of the program to all students' future practice.

Modifications made to the UniFPEP as a result of the evaluation

Based on the outcomes of the UniFPEP evaluation, the curriculum underwent modifications to ensure that it provided optimal learning opportunities for students in both undergraduate exercise science and post-graduate exercise rehabilitation programs. Specifically these revisions ensured that the future program addressed poor knowledge gains regarding falls risk and methods to prevent falls, in addition to the changes in perceived ability to deliver falls prevention exercise programs.

Issues raised in relation to Question 17 (postural sway) were addressed through a slight reworking of the knowledge evaluation questions and the lecture material relating to postural sway. Issues raised as a result of the evaluation of Questions 27 and 28 (medical and sensorimotor risk factors) were addressed in some reworking of, and additions to lecture material. Specific changes made in response to the evaluation findings are summarised below.

Changes to assessment tools

The first consideration in assessing the evaluation findings was whether the UniFPEP course evaluation or knowledge assessment questions required modification for clarity. The

evaluation results were reviewed and all but one question remained in its original form and was deemed useful for future assessment of knowledge gain in delivery of the UniFPEP.

The one question considered to need slight modification was Question 17, in the multiple-choice (Part A) section. The third multiple choice option was changed from “the constant anteroposterior rotation of the body about a midpoint” to “anteroposterior rotation of the body about a midpoint”. For the Likert scale questions about confidence in prescribing exercise (Questions 33 and 34) some additional text was added to make it clear that a score of 0 (zero) represents no confidence and a score of 10 represents full confidence. No other question on any of the assessment or evaluation tools was modified in any way.

Changes to the UniFPEP components and content

To inform which aspects of the lecture content could be improved, consideration was then given to the percent of correct answers to each multiple-choice question and the change in these from the pre to post evaluation. An 'acceptable' correct cut off was set at 80%. For any question that did not achieve a mean score at post evaluation of at least 80%, as indicative of a high level of expert knowledge the relevant lecture notes were reviewed and improvements made to the way that the particular topic or fact was presented.

In response to the student feedback, the learning modules (lecture and laboratory schedule of delivery) were re-structured into more meaningful sections for better application to both classroom-based and online formats to ensure future use of the UniFPEP is not limited by the University of Ballarat timetabling. The modules were also reconfigured from six to nine different learning modules allowing each module to target a specific topic area.

1 – The issue and cost of falls in older people

2 – The physiology of balance and falls

3 – Biomechanics of balance and gait

4 – Falls risk assessment

5 – Evidence for falls prevention interventions

6 - General principles of exercise prescription for older people

7 - General principles of exercise prescription for falls prevention

8 - Exercise prescription for falls prevention: class management and practical application

9 - Medical conditions and exercise prescription for falls prevention

The new lecture structure reflected modifications to the material so that each modified lecture highlighted a specific topic area. The most general change to the course material content was to provide more references and to add an “overview of lecture” slide to each module lecture. The template for the presentation of the slide material was also redesigned.

A fully online version of the UniFPEP was also designed which included videos and photographs interleaved amongst the factual lecture information to provide specific information and demonstrations of the dynamic components of exercise prescription for older people and falls prevention. Inclusion of some videos in the shorter format, would also address the need to educate third year students more fully about the relevance of the course material to their future professional practice.

Specific changes to the curriculum for the final module lectures are listed below:

Revised Lecture 1 – The issue and cost of falls

• Highlighted the incidence rate

• Additional slide on personal costs

• Included photographs to illustrate personal consequences of falls

• Included photos to illustrate risk factors

Revised Lecture 2 – The physiology of balance

• Included a definition of postural sway

• Added some summary points on sensory contributions to standing balance control

• More detail on the vestibulo-ocular reflex

Revised Lecture 3 – Biomechanics of balance and gait

• Increased clarity of the graphs representing spatiotemporal gait pattern changes with age

• Included information regarding muscular control of postural sway

• New slide on the muscular control of gait

Revised Lecture 4 – Falls risk assessment

• Included information about complementary falls risk assessments (including Mini Mental State Examination (MMSE), cognitive impairment, Falls Efficacy Scale International (FES-I), fear of falling, environmental conditions, medications, medical conditions).

Revised Lecture 5 – Evidence for falls prevention interventions

• No changes made

Revised Lecture 6 – General principles of exercise prescription for older people

• Highlighted the factors that pertain to exercise prescription for healthy older people

Revised Lecture 7 – General principles of exercise prescription for falls prevention

• Highlighted exercise prescription for falls prevention

• Added more photos and examples of exercise examples

Revised Lecture 8 – Exercise prescription for falls prevention: class management and practical application

• Highlighted the issues relating to program management

• Added personal factors and program issues that affect program planning and management

• Added diagram help clarify the process of implementing a falls prevention exercise program

Revised Lecture 9 – Medical conditions and exercise prescription for falls prevention

• Highlighted the medical conditions which have the potential to impact specific exercises

• Added a slide to highlight the benefits of exercise for people with a range of co-morbidities.

Outline of the finalised UniFPEP

The finalised content of the enhanced UniFPEP university-based falls prevention program included a range of resources which could be adapted to suit their inclusion in undergraduate exercise science and post-graduate exercise rehabilitation courses throughout Australia. The educational resources included in the final UniFPEP included the following:

Lectures. Slides that formed the series of 6 - 9 lectures were provided in Microsoft PowerPoint Show format. These lectures were developed using the most current scientific theories and evidence-based practice. Topics included: the issue of falls; the mechanisms of falls; human balance physiology; risk factors for falls; falls risk assessment; client/patient management; falls prevention interventions; exercise prescription for older people; exercise prescription for falls prevention; developing community programs and medical conditions and falls prevention.

Written learning exercises. These exercises were provided in the form of multiple-choice tests and short answer questions were designed for students to self-test their knowledge that could be used as short quizzes and exams to be set by the program lecturer/coordinator.

A collection of relevant research literature. This included scientific abstracts related to the theoretical content and PDF documents, where reproduction rights were granted.

A summary of suitable falls risk assessment tools. There are a large number of tools for assessing balance, mobility, physical functioning and falls risk.[32, 38, 161] The UniFPEP provided a summary of the various tools, appropriate to different populations and settings. For example,

the technologies for measuring balance that might be possible in hospitals and clinics versus the 'low tech' options that enable fast and simple measures of balance that would be more appropriate in a community program. The finalised UniFPEP highlighted those tests that are appropriate for given populations, yet have floor or ceiling effects for others. References to those tools that are registered products or copyrighted were also included.

Sample exercise programs. These were specific to different populations of older people and include recommendations regarding the important principles of intensity, frequency, specificity and progression. The example programs refer to a library of exercises, which were provided and categorised by exercise type (strength, balance, endurance, etc.), muscle groups employed, and settings (gym, home, group exercise). The library was constructed using images and instructional text and audio relevant to each exercise.

Links to further falls prevention resources. Contact information and URLs were provided for local, state, national and international resources. For example, details on how to access relevant State and Federal policies, such as the National Falls Prevention for Older People Initiative[64] website (http://www.health.vic.gov.au/archive/archive2014/nphp/#n) are included. These references to falls-related initiatives, associations, networks and community groups were also likely to lead students to further useful resources.

Conclusion

All students who participated in the UniFPEP experienced a significant increase in their confidence to prescribe exercise for the elderly and most notably an increase in their confidence to prescribe exercises targeted for falls prevention. These results were reflected in the high level of practical skills demonstrated by students to prescribe and progress exercises to enhance balance, strength, dual tasking and functional abilities. Overall, the UniFPEP was very well received by students with evaluation scores over 7/10. Student evaluations supported the use of face-to-face lectures and the opportunity to enhance and increase both

confidence and practical application of knowledge during integrated hands-on sessions which include older people as participants.

The evidence-based exercise for falls prevention education program (UniFPEP) developed, implemented and evaluated at the University of Ballarat has now been finalised and prepared for broader use and distribution throughout universities in Australia. The final product also formed the basis for the development of the Fit+Fall=Free program that was implemented and evaluated as a continuing education opportunity for EP throughout Australia, the results of which are presented in Chapter 8.

Chapter 7

Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP)

The following chapter is a word document version of the actual manuscript published in the *Focus on Health Professional Education: a Multidisciplinary Journal (FoHPE),* Australia with tables, figures and referencing changed to be consistent with the presentation of this thesis format.

A copy of the final published manuscript is presented in pdf format in Appendix 5 (The published manuscript in Appendix 5 has been removed for copyright purposes, however, the published version can be accessed via the Federation University Australia Library catalogue at: http://library.federation.edu.au/record=b1294724).

Pascoe, D. A., Sturnieks, D., Close, J. C. T., Tiedemann, A., Lord, S., Twomey, D., & Finch, C. E. (2013). Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP). *Focus on Health Professional Education, 15*(2):55-66.

The results from this chapter were also presented at the Australia and New Zealand Falls Prevention Conference in October 2008 and the Injury Prevention and Safety Promotion National Conference in July 2009.

Pascoe DA, Sturnieks DL, Finch CF, Close JCT, Tiedemann A, Lord SR & Twomey D. (2008). Knowledge outcomes of a university-based professional falls prevention education program. Australia and New Zealand Falls Prevention Conference: Melbourne October.

Awarded Best Paper

Pascoe DA, Finch CF, Sturnieks DL, Lord SR, Close JCT, Tiedemann A & Twomey D. (2009). Knowledge outcomes and retention of a university based falls prevention education program. *9th National Conference. Injury Prevention & Safety Promotion.* Melbourne. July.

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In accordance with the University's Code of Good Practice for the Conduct of Research and the Joint NHMRC/AVCC Statement and Guidelines on Research Practice (1997), each signatory certifies that:

(a) they meet the criteria for authorship through having substantial participation in
- conception and design, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content and
- final approval of the version to be published

(b) they take public responsibility for their part of the publication
(c) there is no other author who meets the criteria for authorship (unless such a person(s) is excluded through their written consent)
(d) the person identified below is the principal author

The principal author is:

Full name (printed)	School	Signature	Date
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Professor Caroline F Finch	10%		03/07/2013

Introduction

There is strong evidence that participation in appropriate exercise can reduce the risk of falls and fall related injury in older people.[5,41,44,70] Whilst research evidence supports the benefits of targeted exercise for falls prevention,[44,49,70] population-level reductions in falls injury rates in older people are yet to be demonstrated.[85,162]

Despite the strong evidence-base for falls prevention, there is a clear gap in translating this evidence into real world practice through the implementation and delivery of effective falls prevention interventions.[11,44] The question arises as to who is responsible for translating the increasing body of research evidence regarding the prevention of falls, into clinical and public health practice. This question was addressed by the Australian 'Fall Translation Task Group', established in 2005 to improve the dissemination and uptake of falls research into policy and practice.[90] A proposed solution was the identification of clinical champions from within the fields of Exercise Physiology, Physiotherapy and other exercise-based professions[6] to facilitate evidence uptake and application of the research evidence.

Like most population-based injury prevention strategies, delivery of exercise interventions requires an appropriately trained workforce with skills in both the delivery of group exercise programs and the prescription of individually-targeted exercise for at-risk groups. To achieve an effective workforce in exercise prescription for falls prevention, strategic efforts are required to build workforce capacity within targeted health care professions to ensure that professionals who provide these services have the pre-requisite skills and expertise in falls prevention. A key strategy for workforce development is the delivery of targeted workforce learning and teaching into undergraduate and post graduate courses.[67]

Appropriate curriculum development is an important aspect of broader strategies aimed at workforce development and education.[163] In terms of injury prevention, it is particularly critical that undergraduate programs aimed at preparing the future healthcare workforce (e.g., for falls

prevention) routinely incorporate injury and illness prevention principles into their curricula.[164] A recent study surveyed the medical education delivered internationally across 31 countries and found that specific education about injury prevention principles was rare.[165] There have been no similar studies of exercise professionals; however, a previous knowledge scoping survey[148] would suggest that there has also been a lack of dedicated injury prevention focus in many Australian university exercise science programs.

Supported by evidence for the effectiveness of exercise, Exercise Physiologists and other university trained exercise and sports science practitioners (Exercise Scientists) routinely prescribe exercise for the prevention, management and rehabilitation of many chronic conditions such as coronary heart disease, hypertension, diabetes mellitus, and some cancers.[166] As such, Exercise Scientists have a responsibility to be aware of, and be responsive to, the mounting research evidence supporting the effectiveness of exercise interventions for these and other conditions associated with older age. The same is true for the efficacy of exercise prescription for falls prevention for older people.

In their complementary roles as both clinical and community exercise professionals, Exercise Scientists are well placed to translate current research findings into better clinical and public health practice. However, knowledge levels regarding falls prevention within undergraduate and postgraduate Exercise Science programs currently fall below the standards expected of professionals equipped to become future 'clinical champions' for exercise for fall prevention.[148]

This paper presents an evaluation of the knowledge outcomes and retention of knowledge of a group of Exercise Science students who received an evidence-based falls prevention curriculum in addition to their standard courses. Based on previous work that reported mean knowledge scores of 58.6%,[148] it was hypothesised that mean student knowledge scores prior to implementation of the curriculum would be less than 60%. It was further hypothesised that student knowledge scores would be positively influenced by the curriculum (reflected in the

post assessment), and students would retain the knowledge gained until follow-up assessment 13 weeks after the conclusion of the curriculum delivery and evaluation. As a result of the intervention of an evidence-based curriculum in falls prevention, it was also expected that students' confidence levels to prescribe exercise for older people to prevent falls would significantly increase after participation in the program.

Methods

The UniFPEP curriculum is an evidence-based fall prevention exercise prescription for older people curriculum developed by the authors (DP, DS, SL, JC, AT) for incorporation into existing university courses. UniFPEP was designed to provide students with necessary background information about falls including social and economic burden, risk factors, the physiological consequences of ageing, biomechanical and physiological principles of balance, and effective falls prevention strategies. The results of a previous knowledge scoping survey of Exercise Science students[148] were used to inform the development and content of the UniFPEP curriculum. Sturnieks et al.[148] identified gaps in current students' knowledge included falls risk factors and interventions to prevent falls and perceived ability to deliver a falls prevention exercise program. Development of the curriculum also drew on the latest evidence on falls risk and prevention. Prerequisite knowledge of the general principles of exercise prescription was assumed as the curriculum was targeted to year 3 Exercise Science (undergraduate) and year 4 Exercise Rehabilitation (postgraduate) student. However, exercise prescription for older people and for falls prevention specifically was not implied knowledge and therefore included in the curriculum.

The educational goal of UniFPEP was to enable students to acquire adequate knowledge and confidence to identify, develop, demonstrate and implement evidence-based falls risk assessments and exercise interventions designed to prevent falls and fall-related injury in older people. The academic curriculum consisted of a combination of theory-based lectures

and practical laboratory sessions, with supplementary materials such as self-implemented quizzes, recommended readings and links to resource-based websites. This format introduced the theoretical components of falls prevention and provided experience in undertaking falls risks assessments and applying exercise prescription to reduce the risk of falls.[167,168]

The UniFPEP curriculum was implemented at the University of Ballarat in March-April, 2008 during the normal teaching period in two delivery formats for year 3 and year 4 students. The year 3 students undertook a 6-hour (2-week) course of five lectures and three laboratory/practical classes, including underpinning knowledge and application of assessment and prescription skills for apparently healthy older adults. The year 4 students undertook a 9-hour (3-week) course of six lectures and four laboratory/practical classes. In addition to the previously described 6-hour course, a 3-hour module was delivered to extend students' application of the falls prevention assessment and offer prescription strategies for use in the exercise rehabilitation field, with a focus on frail older people and those with chronic conditions. All students were specifically trained to develop safe and effective individual and community exercise programs designed to maximise their uptake and adherence in older populations. Recommended reading tasks and take-home self-quiz were provided to supplement each lecture.

The conceptual underpinning of the evaluation of the UniFPEP curriculum was based on the Kirkpatrick and Kirkpatrick four level model for evaluating training programs[72]: 1) participant reaction, 2) participants' changed attitudes, improved knowledge and increased skill, 3) behaviour change resulting from participation; and 4) the final outcomes that occur due to participants' attendance and program completion. The evidence-based curriculum needed to be presented in such a way to bring about not only a positive reaction to the content but to also allow the second level of learning and skill development to take place. If the desired behaviour (i.e. appropriate exercise prescription) is to occur when the students enter the workforce as exercise prescription experts, they need to be confident in prescribing exercise

for falls prevention for some time after completion of the curriculum. The evaluation therefore concentrated on measuring changes in relation to the second level of the evaluation model.

Ethics approval for the delivery and evaluation of the UniFPEP curriculum was granted by the University of Ballarat, Human Research Ethics Committee (approval number A07-104) (Appendix 2A).

Immediately before implementation of the UniFPEP curriculum, a questionnaire was administered to assess the student's baseline knowledge of falls, fall injuries, prevention strategies and the specific role of exercise for falls prevention. The three-part structured questionnaire was modified from that used in a previous survey of Exercise Science students and falls knowledge.[148] Part A included 25 multiple-choice questions (each with four possible answers to select from). It included seven questions related to the epidemiology and cost of falls; one related to risk factors; eight related to the physiology and biomechanics of balance and gait; and nine related to falls prevention interventions. One mark was scored for each correct answer. Part B contained seven short-answer applied knowledge questions that required students to list up to three responses to questions relating to falls risk factors, falls risk assessment and exercise prescription. Answers were coded and scored as follows: 0 (incorrect, or not given), 0.5 (partially correct) or 1 (fully correct). A total score for each question was computed by summing the individual scores for each response. Part C had two 11-point Likert scale (from 0-10) questions that rated students' self confidence in falls prevention and prescribing exercises for the elderly. An identical questionnaire was completed by the students immediately after completing the UniFPEP curriculum to assess immediate changes in knowledge and confidence scores, and knowledge retention was evaluated by the same questionnaire being administered 13 weeks after completing the program.

Students' answers to individual questions in Part A, aggregate scores for Part B and Likert ratings for Part C were analysed using Microsoft Excel and PASW Statistics (version 17.0).

Prior to analysis, data were tested for normality using Q-Q plots. Comparison of mean overall scores at each assessment time, as well as the part-specific means, was undertaken by repeated measures analysis of variance (ANOVA) tests, with year of study as a two-level factor to account for the sampling design. Interactions between year of study and time were also analysed but were not included in the final ANOVA models.

The UniFPEP curriculum was implemented in one year 3 and one year 4 class only, representing 100% of the teaching opportunities for the 2008 cohort of students at the involved university. The evaluation aimed to detect changes in knowledge therefore data from 48 students (30 year 3 and 18 year 4) who provided responses at all three assessments were included in the evaluation. Not all students were present in class during all three testing periods so students with missing data were excluded in the overall evaluation of the UniFPEP curriculum.

Results

Students' mean overall scores for each assessment point are shown in Figure 11. The mean overall knowledge score at the pre-curriculum assessment was 46% and statistically lower than the hypothesised level of 60% ($p<0.001$). There was a significant increase in knowledge levels from pre- to post assessment periods ($F_{1,46}=258.2$, $p<0.001$) and this was sustained at the follow-up assessment ($F_{1,46}=344.3$, $p<0.001$).

Overall scores on Part A of the assessment improved significantly ($p<0.001$) after the completion of the curriculum and were retained at a high level (Table 19). Students significantly improved ($p<0.001$) and retained their level of knowledge of the costs associated with falls. Although they initially showed relatively poor understanding of the physiology and the biomechanics of balance and gait, knowledge increased at post-assessment ($F_{1,46}=156.9$, $p<0.001$) and was further improved at follow-up ($F_{1,46}=142.5$, $p<0.001$). There was a significant

(p<0.001) year level effect with Yr4 students achieving higher scores than Yr3 students at each assessment.

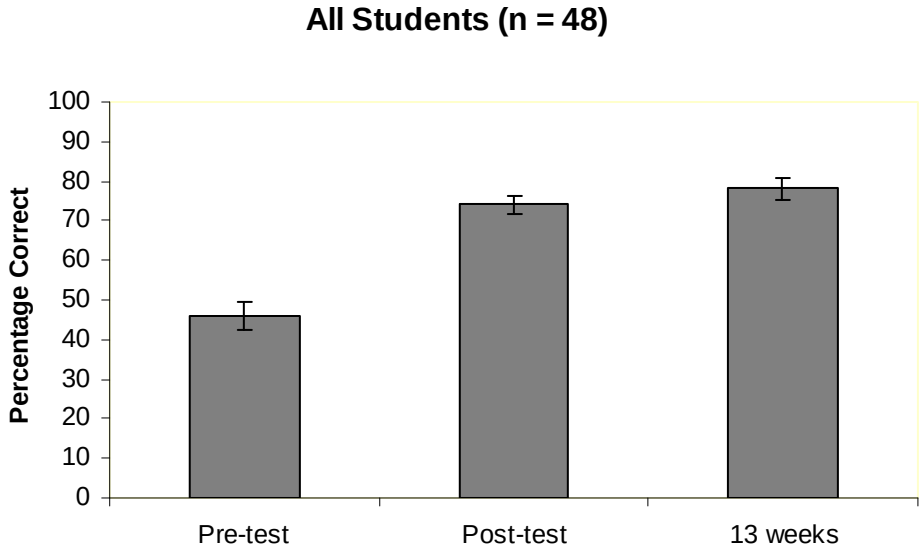

Figure 11 Mean student scores for pre, post and follow-up testing

For Part B, significant increases in knowledge levels were demonstrated at the post (p<0.001) and retained at the follow-up tests (p=0.003) (Table 20). A significant main effect of year level was noted, with year 4 students achieving better scores than year 3 students at all stages of testing ($F_{1,46}$=13.4, p=0.001).

Year level was not a significant main effect for confidence levels, however. All students' self-reported levels of confidence in prescribing exercise for older people improved significantly (p<0.001) between pre and post assessments and were maintained until the 13-week follow-up (p=0.002) (Table 21), with similar changes in confidence, pre-post (p<0.001) and pre-follow-up (p=0.045)), reported by both year 3 and year 4 students.

Table 19 Student percentage scores for Part A, presented overall and for topic theme; risk factors, costs, physiology and biomechanics and interventions.

Overall Part A results				ANOVA Comparisons	
	Pre	**Post**	**13 weeks**	**Time**	**Year level**
All students (n = 48)	59.9 (57.2 – 62.6)	80.3* (77.7 – 82.9)	79.8* (77.3 – 82.4)	$F_{2,92}$ = 103.77 p<0.001	$F_{1,46}$ = 17.00 p<0.001
Year 3 (n = 30)	56.3 (53.3 – 59.2)	78.5* (75.3 – 81.7)	77.3* (74.3 – 80.4)		
Year 4 (n = 18)	66.0 (62.2 – 69.9)	83.3* (79.2 – 87.4)	84.0* (80.0 – 87.9)		
Risk factors (1 question)					
All students (n = 48)	88 (78 - 97)	100* (p = .03)	100* (p = .03)	$F_{2,92}$ = 5.00 p=0.009	$F_{1,46}$ = 1.25 p<0.269
Year 3 (n = 30)	83 (71 - 96)	100*	100*		
Year 4 (n = 18)	88 (79 – 110)	100*	100*		
Costs (7 questions)					
All students (n = 48)	77.4 (73.4 – 81.3)	90.7* (90.1 – 93.9	94.0* (91.3 – 96.9)	$F_{2,92}$ = 28.73 p<0.001	$F_{1,46}$ = 0.02 p=0.907
Year 3 (n = 30)	76.1 (71.1 – 81.3)	78.1* (88.4 – 96.3)	93.3* (89.7 – 96.9)		
Year 4 (n = 18)	79.4 (72.7 – 86.0)	88.1* (83.0 – 93.1)	95.3* (90.6 – 99.9)		
Physiology and Biomechanics (8 questions)					
All students (n = 48)	47.9 (43.3 – 52.5)	74.3* (69.5 – 79.0)	69.5* (64.6 – 74.4)	$F_{2,92}$ = 38.20 p<0.001	$F_{1,46}$ = 12.28 p=0.001
Year 3 (n = 30)	43.4 (37.9 – 48.9)	71.6* (65.8 – 77.6)	65.0* (59.1 – 70.9)		

Year 4 (n = 18)	55.5 (48.5 – 62.6)	78.5* (70.8 – 86.1)	77.1* (69.5 – 84.6)		
Interventions (9 questions)					
All students (n = 48)	53.9 (48.8 – 59.1)	75.4* (71.3 – 79.6)	75.7* (71.2 – 80.2)	$F_{2,92}$ = 37.27 p<0.001	$F_{1,46}$ = 9.64 p=0.003
Year 3 (n = 30)	49.2 (43.1 – 55.4)	71.4* (66.5 – 76.3)	73.3* (67.7 – 79.0)		
Year 4 (n = 18)	61.8 (53.8 – 69.7)	82.1* (75.8 – 88.4)	79.7* (72.3 – 86.9)		

Values are expressed as mean test scores (95% CI)
*Significantly greater than pre-test scores (p<0.05)

Table 20 Student percentage scores for Part B, indicating knowledge in exercise prescription knowledge

	Pre	**Post**	**13 weeks**	**ANOVA Comparisons**	
Short Answer (max score=20)				**Time**	**Year level**
All students (n = 48)	28.75 (23.45– 34.00	66.50* (62.65 – 70.35)	75.90* (71.90 – 79.85)	$F_{2,92}$ = 189.84 p<0.001	$F_{1,46}$ = 14.45 p<0.001
Year 3 (n = 30)	22.80 (16.70– 28.90	63.10* (58.40 – 67.75)	72.10* (67.30 – 76.85)		
Year 4 (n = 18)	38.60 (30.75 – 46.50	72.20* (66.20 – 78.25)	82.20* (76.10 – 17.67)		
Questions addressing Exercise Prescription (max score=15)					
All students (n = 48)	31.47 (27.80 – 39.60)	76.47* (73.27 – 82.20)	83.00* (80.40 – 87.73)	$F_{2,92}$ = 192.58 p<0.001	$F_{1,46}$ = 12.45 p=0.001
Year 3 (n = 30)	24.60 (17.40 – 31.87)	72.67* (67.20 – 78.13)	79.80* (75.27 – 84.27)		
Year 4 (n = 18)	42.80 (33.40 – 52.13)	82.80* (75.73 – 89.80)	88.33* (82.47 – 94.13)		

Values are expressed as mean percentage test scores (95% CI)
*Significantly greater than pre-test scores (p<0.05)

Table 21 Part C results, indicating students' levels of confidence in prescribing exercise for the older people and for falls prevention (scored on a scale of 0 - 10)

Confidence in Exercise Prescription for Older People				**ANOVA Comparisons**	
Year Level	**Pre**	**Post**	**13 weeks**	**Time**	**Year level**
All students (n = 48)	4.7 (4.1 – 5.2)	7.1* (6.8 – 7.4)	7.6* (7.2 – 7.9)	$F_{2,92}$ = 76.2 p<0.001	$F_{1,46}$ = 2.474 p=0.123
Year 3 (n = 30)	4.3 (3.6 – 4.9)	7.1* (6.8 – 7.5)	7.3* (6.9 – 7.8)		
Year 4 (n = 18)	5.3 (4.4 – 6.2)	7.0* (6.5 – 7.5)	8.0* (7.4 – 8.9)		
Confidence in Exercise Prescription for Falls Prevention					
Year Level	**Pre**	**Post**	**13 weeks**	**Time**	**Year level**
All students (n = 48)	4.0 (3.5 – 4.6)	7.2* (6.9 – 7.5)	7.5* (7.2 – 7.9)	$F_{2,92}$ = 106.8 p<0.001	$F_{1,46}$ = 1.9 p=0.177
Year 3 (n = 30)	3.6 (2.9 – 4.3)	7.3* (6.9 – 7.7)	7.4* (6.9 – 7.8)		
Year 4 (n = 18)	4.8 (3.9 – 5.7)	7.0* (6.6 – 7.4)	7.8* (7.2 – 8.4)		

Values are expressed as mean scores (95% CI)
*Significantly greater than pre-test scores (p<0.05)

Discussion

There is an increasing need for an adequately prepared workforce to deal with a range of health issues, including those associated with demographic changes associated with ageing populations.[81,99] Whilst most proponents of this view have been focused on medical or allied health professions, there is also a need for workforce development in professions which focus specifically on exercise prescription for health and the prevention of injury and illness through appropriate exercise prescription.[6] To our knowledge, this is the first study to explore the

knowledge outcomes associated with the delivery of a curriculum specifically developed for exercise professionals. The focus on injury prevention skills in this group is also novel, as most previous research into injury knowledge education has focused on medical students or allied health groups such as midwives.[164,169,170]

As expected, following the presentation of a specifically targeted curriculum in exercise for falls prevention, knowledge outcomes and self-reported confidence to prescribe exercise for older people and for falls prevention were significantly increased. Our findings indicate that a large change in knowledge and confidence can be achieved during a 2-3 week educational period during a normal university semester. More importantly, these changes were retained 13 weeks after completion of the UniFPEP curriculum.

According to the Australian Vice-Chancellors' committee, a grade of 70% corresponds to enhanced knowledge levels for students. Prior to participation in the UniFPEP curriculum students scored failing grades (< 50%) on the pre-test; however, they increased their knowledge levels to 78% at post-test, just short of high distinction level for many Australian universities.[152] Similar patterns of improvement in results were seen for both the year 3 and year 4 groups of students although year 4 students' scores were slightly higher across most measures. Improved knowledge scores in year 4 students may have a twofold explanation: 1) these students were exposed to an extra three hours of the UniFPEP curriculum, and 2) the year 4 students would generally have more exercise prescription experience and perhaps better knowledge application. The initial knowledge gain for all students between pre and post-testing was not only maintained at the 13-week follow-up, but increased slightly indicating that students retained the initial knowledge gains. Furthermore, it could be assumed that other concurrent studies being undertaken by the participating students were complementary to the knowledge base emphasised in UniFPEP.

The results of this research show that a university based curriculum intervention for Exercise Scientists provides an approach in addressing the first two levels of the Kirkpatrick and Kirkpatrick's[72] evaluation model. This study suggests that levels one (reaction) and two (learning) of the model can be achieved with a university-delivered curriculum. Level one was evaluated using a health promotion methodology[147] which allowed the evaluation process to be impartial and encourage both negative and positive feedback and a chance to turn any criticisms of the program into recommendations. This format also uses a group consensus approach which ensures anonymity of individuals when feedback about the program is presented. However, this paper presents results at level two of the Kirkpatrick and Kirkpatrick model. (Results from the level one evaluation have not been included). Assessment of the third level of the model (assessment of changed healthcare outcomes in falls prevention) requires the students who participated in this study to be monitored for at least 6-12 months following completion of this curriculum. To address level four of the model, evaluation would need to assess the extent to which UniFPEP students actually apply their gained falls prevention knowledge in their subsequent work would need to be assessed. It is strongly recommended that future studies of the value of falls prevention curricula incorporate an adequate period of follow-up to determine any flow-on effects to actual public health service or program delivery.

Limitations

The UniFPEP curriculum was implemented at one university across two year levels of study and with a limited number of students. The data was limited to those students who completed all three testing periods. Given the nature of tertiary education, voluntary class attendance and absences due to illness, some students missed at least one testing period.

No control group was used in this study because the UniFPEP content was part of the deliverable curriculum for these year levels, and it would not have been appropriate in an educational setting to withhold learning material from any group of students. This has allowed

a realistic application of the curriculum and, although based on a limited cohort of students, the results encourage further broader implementation. Minimal bias however was evident at baseline testing as results were similar to that previously reported from a workforce scoping survey across seven universities.[148]

Due to University timetabling it was not possible to conduct follow-up testing beyond the 13 weeks of the standard university semester. To adequately determine long term retention beyond university based study, it is recommended that participants are followed-up over a longer period of time. Furthermore, within the limitations of this study, it was not possible to formally assess whether skills were effectively applied in the workplace. The UniFPEP curriculum aimed to develop knowledge and skills that may be formally implemented in exercise programs delivered to older populations. The implementation of skills and knowledge in such programs requires further study.

Conclusion

Opportunity exists for capacity building within the Exercise Science profession[6] via specific undergraduate and postgraduate curriculum developments to improve general injury prevention knowledge delivery.[164,165] This paper offers an effective way to prepare future Exercise Scientists and exercise professionals to help bridge the gap between research and practice in exercise prescription for falls prevention. We have demonstrated that significant gains in knowledge and confidence can be made in this area in a relatively short time frame. Researchers, policy makers, funding agencies and universities need to work collaboratively with Exercise Scientists to further develop and broaden the dissemination of this knowledge to provide the public sector and allied health workforce with the clinical champions it needs.

Chapter 8

Evaluation of a continuing education program on falls prevention (Fit+Fall=Free): a controlled trial

The results from this chapter were presented at the Exercise and Sport Science / Sport Dietitian Association: Science & Nutrition in Exercise & Sport 'From Research to Practice' Conference in April 2010.

Pascoe DA & Finch CF. Delivery and evaluation of a continuing education program for exercise practitioners in falls prevention and exercise prescription for older people. (Poster) *ESSA/SDA 2010: Science & Nutrition in Exercise & Sport 'From Research to Practice' Conference*. Gold Coast 9-11 April 2010.

This chapter has been removed at the authors request

Chapter 9
Summary, conclusions and recommendations

Summary

Falls prevention is an important focus for governments, policy makers, researchers, allied health professionals, practitioners and the individuals affected by falls.[63-65] The EP profession has the potential to become champions of exercise prescription for falls prevention and by doing so lead a nationwide attack on falls, falls risk and fall related injuries. However, to realise this potential within the EP profession a number of strategies will need to be implemented and maintained into the future.

The purpose of this PhD was to investigate a method to enhance the translation of research evidence and provide an avenue to build workforce capacity using the delivery and evaluation of undergraduate, post-graduate and continuing education programs within the accredited EP profession. This was accomplished by developing, implementing and evaluating a series of falls prevention curricula for undergraduate, post-graduate university students and continuing education programs for workforce professionals in the field of exercise science and exercise physiology.

Participation in CEPs and other efforts to translate evidence-based guidelines and/or research into practice is an ongoing and necessary part of professional practice, workforce development and capacity building in many healthcare professions. The provision and delivery of evidence-

based education programs is underpinned by the belief that exposure to new professionally relevant material leads to knowledge gains that supports healthcare professionals to change or improve their clinical behaviour/practice, which in turn results in improved outcomes for patients.

The overall framework for this study was based on the combination of three existing frameworks from the areas of capacity building,[67] knowledge translation[68] and curriculum planning for the education of adults.[69] The specific focus for the study was based primarily in the action area of workforce development within the Capacity Building Framework developed by the New South Wales Health Department.[67] The Capacity Building Framework[67] allowed the workforce development process to be initiated within the exercise physiology profession in response to the identified need for a strategic approach to addressing the priority of falls prevention in older people.

Unfortunately, the majority of research into the effectiveness of health sector education programs and CEPs has focussed on physicians, general practitioners, nurses, pharmacists and administration staff.[108] There has been very limited research targeting the exercise-based healthcare professions of physiotherapy/physical therapy, occupational therapy, athletic training, EP and exercise science. This was supported by the results of the systematic review in Chapter 3 which revealed that only 20 studies have systematically evaluated CEPs in the exercise-based health care professions using evaluation tools based on quantitative measures. However, the methods used to evaluate the effectiveness of the CEPs and the extent to which the desired outcomes are being achieved in CEPs varies greatly and it was highlighted that providers of CEPs for exercise-based health professionals do not have a sound objective evaluation framework such as the Kirkpatrick's[72] four levels model. If evidence-based education programs and CEPs aim to enhance, improve or update participant knowledge, skills and behaviour, at the very least, they need to objectively measure pre and

post levels to determine if change has occurred and the extent of that change. Only nine of the 20 studies in the review conducted and evaluated pre and post-testing of knowledge as a measure of appraising the overall efficacy of the education intervention.

This PhD body of work has developed, implemented and evaluated two targeted education programs aimed at increasing knowledge, skills and confidence in exercise prescription for falls prevention of the future and current accredited exercise physiology workforce. The UniFPEP university-based curriculum was delivered as part of usual university classes for year 3 exercise science and year 4 exercise rehabilitation students producing significant gains in knowledge and confidence of all participants. All students achieved a significant increase in knowledge and confidence to prescribe exercise for the elderly and most notably an increase in knowledge and confidence to prescribe exercises for falls prevention. These results were reflected in the high level of practical skills demonstrated by students to prescribe and progress exercises to enhance balance, strength, dual tasking and functional abilities. Overall the UniFPEP was very well received by students with evaluation scores over 7/10. Student evaluations support the use of face-to-face lectures and the opportunity to enhance and increase both confidence and practical application of knowledge during integrated hands-on sessions.

The development, implementation and evaluation of the Fit+Fall=Free CEP targeted the current EP workforce and was investigated via a CCT to evaluate and compare knowledge gains, confidence and behaviour change following participation in either a face-to-face or online delivery compared to a control. The results of the CCT showed that significant knowledge gains and increases in confidence can be attained from both a face-to-face or online delivery. However the face-to-face delivery showed greater retention of knowledge and confidence gains after six months than the online delivery group.

The results of the Fit+Fall=Free CEP CCT are relevant to four separate but connected audiences: 1) educators who wish to translate current research into practice; 2) professional organisations who need to provide ongoing education to practitioners in the workforce; 3) allied health professionals who require access to the latest research in a format that meets their professional and personal workplace needs; and 4) the health sector who need to continue to build capacity within the allied health workforce to assist in allaying potential risks and costs associated with health care for an ageing population.

Following completion of the respective UniFPEP and Fit Fall=Free exercise for falls prevention curriculum all participants demonstrated significant gains in knowledge levels and confidence. Therefore, no matter what the level of learning or experience of participants, all who complete an evidence-based the UniFPEP or Fit+Fall=Free curricula will be better prepared to bring about a positive change in the provision of exercise for falls prevention in all exercise programs delivered for older people.

In the future, a comparison of the knowledge levels and confidence scores of university students and EPs from the current workforce could be conducted to determine the greatest potential for knowledge translation to maximise the impact on exercise for falls prevention. Based on the raw data scores for knowledge and confidence from the UniFPEP and the Fit+Fall=Free CEP, there were greater knowledge gains and increased confidence levels at the workforce level following participation in the respective education programs. Even though both the UniFPEP and the Fit+Fall=Free CEP achieved significant increases in knowledge and confidence of the university students and professional exercise physiologists respectively, the delivery of an evidence-based curriculum specifically targeting the current workforce may have a greater immediate impact on patient outcomes.

Conclusions

In conclusion, this body of PhD work highlights the need for the development and widespread implementation of an evidence-based “exercise for falls prevention” curriculum for both future and current exercise science professionals and exercise physiologists. Educators across the research and university sectors have a need and obligation to translate current research into practice but the best of means of meeting this need is open for discussion. The mandatory accreditation requirements provides a readily available avenue to access working the workforce and update current knowledge and practices and impact health outcomes for patients. Adoption and dissemination of university and workforce curricula would improve workforce capacity for falls prevention in a matter of a few years. Increased delivery of appropriately targeted exercise programs to older people will reduce their risk of falling, reduce their risk of fall-related injury and improve their general quality of life by improving functional capabilities. In doing so, exercise science professionals and exercise physiologists will collectively make a significant contribution to improving long-term public health.

This PhD study demonstrates effective methods to prepare the future and current exercise physiology workforce to help bridge the gap between research and practice in exercise prescription for falls prevention. The results have demonstrated that significant gains in knowledge and confidence can be made in this area in a relatively short time frame. Researchers, policy makers, funding agencies and universities need to work collaboratively with the exercise physiology profession to further develop and broaden the dissemination of evidence-based education programs such as the UniFPEP and the Fit+Fall=Free CEP to provide the public sector and allied health workforce with the clinical champions it needs.

Limitations

The number of participants for implementation of the UniFPEP phase of the study was determined by the number of students enrolled in the selected undergraduate and post-graduate classes targeted for delivery of the falls prevention curriculum.

The number of participants for the Fit+Fall=Free phase of the study was determined by the number of professionals who signed up for the continuing education program through the continuing education program promoted by ESSA.

All recruiting for the continuing education program was conducted through the Exercise and Sport Science Australia which may have impacted the study in terms of the abilities and limitations inherent within the ESSA communication, follow-up and administrative systems.

Recommendations

Continuing education program providers and accrediting bodies need to improve the research design and development of CEPs in the future to allow evaluation of knowledge transfer into professional practice and improved healthcare outcomes. Varying levels of evidence-based modules in exercise for falls prevention need to be delivered in universities and built into curricula at the appropriate level to provide a very relevant and applied context of exercise prescription.

There is also a serious need to adopt standardised testing and evaluation tools for education programs within allied health or single professions which allows the comparison of results across all four levels of Kirkpatrick's model of evaluation for training programs. Added to this the use of self-reported measures to evaluate knowledge gain and behaviour change without accompanying objective measures places doubt on the reliability of the results gained in

university-based and workforce CEPs which ultimately will determine the true effectiveness of the respective education programs.

Introduction of a variety of levels of workplace CEPs within the area of exercise prescription for older people and exercise prescription for falls prevention. There is most likely a need for an introductory level, professional update or workforce refresher (follow-up from university studies).

Delivery of latest research to enhance practice and encourage greater use, reporting or contribution to the research and record keeping within the falls prevention area in allied health would be of continued benefit within exercise physiology practice. To encourage overall engagement and full participation in the CEP, participants could also be offered an assessment which ‘qualifies’ those who complete all aspects of the education program.

Continuing education providers and accrediting bodies may need to consider staging a cyclical timetable of CEPs to allow and ensure the current workforce remains updated as research continues to provide new and relevant evidence-based information for inclusion in CEPs. This may need to occur every 5 years or so, given that the majority of participants in this study had been practicing for four or less years. The cycling of CEPs may also become necessary to continue to build capacity within the current and future exercise physiology workforce.

Final word

There remains much important work to be done to translate evidence-based research in exercise for falls prevention and educational insights into common practice within the exercise science and EP professions. In many respects, the fundamental challenges of teaching and learning in university-based and workforce programs have great promise but in many other respects they will continue to persist. As Ruben[186] states……

> "If one can fail to learn from a book, one can just as effectively also fail to learn from the internet, or in class or whatever mode of delivery is presented. So the quest must continue and what better group to guide this effort and to focus society on those critical challenges than those dedicated to the theoretical and practical connections between experience, teaching and learning".[186]

Even with the significant results obtained within this PhD research, the above statement remains the ongoing challenge for all those involved in evidence-based allied health practice and in particular in the area of knowledge translation for exercise for falls prevention in the exercise physiology profession.

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Appendix 1A

Ethics Approval - A07-104

Human Research Ethics Committee (HREC)
Research & Graduate Studies Office

HUMAN RESEARCH ETHICS APPROVAL FORM

Principal Researcher/Supervisor: C Finch

Associate/Student Researcher/s: D Pascoe, S Lord, D Sturnierks, J Close, A Tiedemann, D Twomey, P Swan

School: HMSS

Ethics Approval has been granted for the following project:

Project Number: A07-104

Project Title: Development of a workforce education program for exercise practitioners in falls prevention and exercise prescription for older people

For the period: 29/8/2007 **to** 1/7/2008

Please quote the Project No. in all correspondence regarding this application.

PLEASE NOTE:

A final report for this project must be submitted to the HREC Executive Officer on:
1 August 2008

Signed: L J Quinlan (Executive Officer, HREC) Date: **29 August 2007**

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CRICOS Provider Number 00103D

Appendix 1B

Ethics Approval - A08-128

Human Research Ethics Committee

HUMAN RESEARCH ETHICS APPROVAL FORM

Principal Researcher/Supervisor:	C Finch
Associate/Student Researcher/s:	D Pascoe P Swan
School:	HMSS
Project Number:	A08-128
Project Title:	Delivery and evaluation of a continuing education program for exercise practitioners in falls prevention and exercise prescription for older people
For the period:	12/10/2008 **to** 31/12/2009

Please quote the Project No. in all correspondence regarding this application.

REPORTS TO HREC:

An annual report for this project must be submitted to the Ethics Officer on:
17 November 2009
www.ballarat.edu.au/ard/ubresearch/hdrs/ethics/humanethics/docs/final_report.doc

A final report for this project must be submitted to the Ethics Officer on:
1 September 2010
www.ballarat.edu.au/ard/ubresearch/hdrs/ethics/humanethics/docs/final_report.doc

Ethics Officer
12 October 2008

If any changes are to be made to this project, a 'Request for Amendments' form must be completed and forwarded to the Ethics Officer for approval.

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Appendix 2

Accreditation of Fit+Fall=Free as an ESSA approved continuing education program

15th October 2008

Dear Deborah,

The Continuing Education Committee (CEC) of the Australian Association for Exercise and Sport Science (AAESS) has completed the review of your recent application for the accreditation of your Continuing Education Opportunity (CEO), the details of which follow:

CEO Title:	Fit + Fall Free – fall prevention and exercise prescription for older people
Accreditation Type:	Facilitated
Provider:	University of Ballarat
Delivery Date(s):	*23rd November, 30th November, 7th December*
Location(s):	*Melbourne, Sydney, Brisbane*
CEO Duration:	8 hours
Continuing Education Points (CEPs):	*8*

The accreditation of your CEO entitles you to use the AAESS logo and include the following statement in your materials:

"The AAESS Continuing Education Committee certifies that this continuing education offering meets the criteria for 8 Continuing Education Points (CEPs)."

For those CEOs operating under a company/business name that is included in the continuing education material, the following statement must be included on the title page of the CEO.

"AAESS registration of this Continuing Education Opportunity does not imply endorsement of the sponsoring organisation's products/services."

Following the first delivery of the CEO you are required to submit a photocopy of the CEO evaluation forms. Provided that there is a general consensus that the CEO is of a high quality the accreditation of the CEO is valid for 3 years. You are entitled to conduct this CEO unlimited times over the 3 year period provided that the CEO is not significantly altered. Changes to the CEO that are permissible include, formatting modifications, updating references and any minor corrections. You must contact AAESS 1 month prior to any intended delivery date and provide the following information:

- Name of CEO
- Intended date, time and venue
- If a change in presenter is required, the coordinator must submit to the Continuing Education Committee the presenter's CV, a letter outlining the reason for the change and provide an assurance that the quality of the course will be upheld.

AAESS reserves the right to revoke the accredited status if the provider fails to deliver the CEO as outlined in the application. If revoked, participants will not be able to claim the CEPs.

We thank you for your application and support of the AAESS' Continuing Education Program. We will now advertise your CEO to AAESS members through email, the

AUSTRALIAN ASSOCIATION FOR EXERCISE AND SPORTS SCIENCE

AAESS is the peak professional organisation promoting excellence in, and recognition of, the exercise and sports science professions

AAESS secretariat
PO Box 123
Red Hill Qld 4059

T: 07 3856 5622
F: 07 3856 5688
E: aaess@aaess.com.au
www.aaess.com.au
ABN 14 053 849 460

website and newsletter. If you have any further enquiries please do not hesitate to contact the Continuing Education Committee at CEC@aaess.com.au.

Kind regards,

Laura Vidmar
Professional Services Officer
laura.vidmar@aaess.com.au

Appendix 3A

Chapter 5: Published manuscript and supplementary data

Sturnieks DL, Finch CF, Close JCT, Tiedemann A, Lord S & **Pascoe DA.** (2010). Exercise for falls prevention in older people: Assessing the knowledge of exercise science students. *Journal of Science and Medicine in Sport, Australia, 13*(1):59-64. (The published manuscript has been removed for copyright purposes, however, the published version can be found at: http://dx.doi.org/10.1016/j.jsams.2008.11.005.)

Supplementary file 1 - Knowledge survey

School of Human Movement & Sport Sciences

Australian Government
Department of Health and Ageing

Prince of Wales Medical Research Institute

EXERCISE PRESCRIPTION FOR THE PREVENTION OF FALLS IN OLDER PEOPLE

Name of University			
Name of course			
Current year level of study			
Male ☐	Female ☐	Age (years)	

PART A - Please select only ONE response per question

1. The projected health care costs attributable to falls over the next 50 years is expected to:
   ☐ decrease ☐ decrease then increase ☐ remain the same ☐ increase
2. One of the most serious injuries resulting from a fall in older people is:
   ☐ fractured wrist ☐ dislocated shoulder ☐ sprained ankle ☐ fractured hip
3. A region of the brain that is particularly important for control of balance is:
   ☐ the temporal lobe ☐ the hypothalamus ☐ the cerebellum ☐ the third ventricle
4. An appropriate exercise to prescribe a person who performs poorly on the "Timed Up and Go" test would be:
   ☐ going up and down stairs ☐ exercise bike ☐ upper body resistance training ☐ lateral leg raises
5. Three sensory systems important for balance are:
   ☐ visual, vestibular, proprioception ☐ visual, auditory, taste ☐ visual, vestibular, smell ☐ proprioception, visual, auditory
6. Most falls in older people occur due to:
   ☐ fainting ☐ slips and trips ☐ vertigo ☐ banana peels
7. Compared to young adults, the gait patterns of older adults generally have:
   ☐ increased velocity ☐ a narrower step width ☐ reduced cadence ☐ increased stride length
8. A major medical risk factor for falls in the general population is:
   ☐ cancer ☐ cardiovascular disease ☐ liver disease ☐ impaired cognition
9. Increasing age is NOT associated with a loss of:
   ☐ strength ☐ visual acuity ☐ neurons ☐ stiffness
10. For people aged 65 years and over, what percentage of falls leads to an injury which results in hospitalization?
    ☐ 1% ☐ 4% ☐ 8% ☐ 15%
11. Falls risk assessment should be:
    ☐ medically focused, sensitive, repeatable, complicated ☐ multifactorial, reliable, valid, sensitive ☐ environmentally focused, easy ☐ medically focused, sensitive, reliable, valid

This survey is part of a project that is being funded by the Australian Government Department of Health and Ageing.

12. What is the yearly rate of falls for people aged over 65 years:

- ☐ 1 in 3
- ☐ 1 in 5
- ☐ 1 in 10
- ☐ 1 in 20

13. The muscle groups most active during standing balance are:

- ☐ quadriceps, hamstrings and abdominals
- ☐ biceps, pectorals, peroneals
- ☐ ankle, dorsiflexors, hip abductors and ankle plantarflexors
- ☐ hamstrings, gluteals and abdominals

14. Older adults are less stable in the:

- ☐ lateral direction
- ☐ anterior direction
- ☐ posterior direction
- ☐ medial direction

15. To improve trip recoveries, it is important to:

- ☐ increase toe clearance in gait
- ☐ wear firmly fitting shoes
- ☐ use a walking stick
- ☐ develop lower limb power

16. What is the most common cause of serious injury in older people?

- ☐ road trauma from a car crash
- ☐ fall from a ladder during home repairs
- ☐ hip fracture from a fall
- ☐ hot water scald

17. The vestibular system:

- ☐ is housed within the middle ear
- ☐ provides information regarding head position
- ☐ provides information regarding the centre of pressure position
- ☐ includes receptors in muscles and joints

18. Which of the following is an example of multiple tasking during gait pattern variation and enhancement training?

- ☐ walking while counting backward
- ☐ walking on heels then walking on toes then walking on heels
- ☐ stepping over obstacles at various heights
- ☐ going up and down stairs

19. The centre of mass is:

- ☐ the heaviest part of the body
- ☐ the point where the resultant of all ground reaction forces act
- ☐ the point around which every particle of the body's mass is equally distributed
- ☐ the middle of the chest

20. Older adults have an increased reliance on vision for balance, primarily due to:

- ☐ poor vestibular sense
- ☐ poor peripheral sensation
- ☐ poor hearing
- ☐ poor reaction time

21. Osteoporosis is associated with an increased risk of:

- ☐ falls
- ☐ balance deficits
- ☐ fractures
- ☐ sensory loss

22. Postural sway is:

- ☐ the deviation in head position over time
- ☐ the constant fluctuation in centre of mass position from the vertical
- ☐ the constant anteroposterior rotation of the body about a midpoint
- ☐ the constant rotation of the ankles

23. Many factors can be used to predict the risk of falling in the elderly. Approximately three quarters of community dwelling fallers may be predicted by:

- ☐ muscle weakness
- ☐ poor judgment
- ☐ extrinsic risk factors
- ☐ poor sensorimotor performance

24. What is the worst expected outcome of a hip fracture?

- ☐ death
- ☐ hospitalisation
- ☐ bruising
- ☐ need to see a GP

25. If a participant loses balance while standing on foam with their eyes closed, what would be an appropriate activity to practice/prescribe?

- ☐ walking on firm surface while turning the head
- ☐ walking on grass while turning the head
- ☐ standing on foam and looking at a target on the wall
- ☐ standing on a firm surface and tossing a ball

26. Foot problems associated with impaired balance and increased risk of falls do NOT include:

- ☐ hallux valgus
- ☐ reduced toe flexibility
- ☐ reduced plantar tactile sensitivity
- ☐ toe muscle weakness

27. The vestibulo-ocular reflex is:

- ☐ spontaneous responses from the head in response to motion of the eyes
- ☐ opposing motion of the eyes in response to centre of mass movements
- ☐ reflex peripheral motor reactions in response to movement of the eyes
- ☐ opposing motion of the eyes in response to motion of the head

28. What exercises would best help an older adult who has a flat foot strike and often trips while walking?

- ☐ heel raises
- ☐ squats
- ☐ toe raises
- ☐ gastrocnemius stretching

29. Guidelines for developing balance training for healthy older people should follow:

- ☐ dynamic to static
- ☐ unilateral to bilateral
- ☐ multidirectional to unidirectional
- ☐ stable to unstable surfaces

30. The primary purpose of multi-sensory training is to improve:

- ☐ the ability to maintain a better upright position in space
- ☐ the use of both motor and sensory systems for balance
- ☐ gait pattern and stability in gait
- ☐ the use of visual, somatosensory and vestibular information for maintenance of upright posture

31. Interventions most successful for reducing falls include:

- ☐ walking program
- ☐ fitness training
- ☐ glasses (vision) modification
- ☐ balance training

32. The best method to progress a balance training programme by adding a cognitive task is to:

- ☐ provide fewer instructions while walking around an obstacle course
- ☐ counting backwards while walking around an obstacle course
- ☐ increase the level of fear or anxiety while walking around an obstacle course
- ☐ walking with bare feet around an obstacle course

33. What is the most costly type of injury to treat in older people?

- ☐ self harm
- ☐ road trauma
- ☐ violence
- ☐ injury from a fall

PART B - You may answer YES to more than one response

34. Safe shoes for older adults should have the following characteristics

	YES	NO
high heel collar		
laces		
high heel		
tight fitting		
dense midsole		
slip resistant outersole		
loose fitting		
midsole cushioning		

35. Which of the following are examples of functional mobility and balance tests?

Timed Up & Go		
Berg Balance Scale		
Functional Reach Test		
Sit to Stand		
Blood Pressure Testing		
Beep Test		
Visual Acuity		

36. Which major sensorimotor areas are important for screening falls risk

flexibility		
strength		
balance		
vestibular Sense		
reaction Time		
proprioception		
endurance		
vision		

37. Assessment of environmental hazards around the home should include

loose rugs		
hand rails		
lighting		
medications		
slippery surfaces		
spilt liquids		
obstructed walkways		
non-contrasting steps		
history of falls		
demographic information		
unstable furniture		

PART B CONTINUED

38. A general screening for falls risk for older people would include

	YES	NO
environmental hazards		
strength and balance		
history of falls		
genetics		
number of medications		

PART C - Rank from 1 to 4 in order of easiest to most difficult

39. The order of exercises that may be used to enhance standing steadiness is:

	RANK
standing on a foam surface with eyes open	
standing on a wobble board with eyes closed	
walking on a foam surface while focusing on a target	
standing on a firm surface while tossing a ball	

40. The order of standing postures that should be used to progress balance training in older people is:

2 feet stance with grab rail	
2 feet shoulder-width stance	
2 feet together	
single leg stance	

41. During seated centre of gravity training:

hands on thighs	
hands on ball	
hands folded across chest	
hands above head	

42. The following exercises can be used to enhance dynamic balance. Rank from 1 to 4 in order of easiest to most difficult.

walking along a beam	
walking along a line	
sit to stand	
obstacle course	

Supplementary file 2

Supplementary table: Impact of year level on knowledge about specific issues

Knowledge topic area	Mean % correct score	Year of study effect
Issue/cost of falls	64.6 (SEM 0.4)%	$\chi^2_{(2,n=566)}$=22.89, p<0.001 • second < third (mean difference 4.23%, p<0.001) • second < fourth (mean difference 3.80%, p=0.001).
Risk factors	52.6 (SEM 0.9)%	$\chi^2_{(2,n=566)}$=16.25, p<0.001 • second < third (mean difference 4.25%, p=0.024) • second < fourth (mean difference 8.08%, p<0.001) years
physiology/biomechanics	56.6 (SEM 0.8)%	$\chi^2_{(2,n=566)}$=44.35, *p*<0.001 • second < third (mean difference 8.82%, p<0.001) • second < fourth (mean difference 11.39%, p<0.001*).*
interventions	63.1 (SEM 0.9)%	$\chi^2_{(2,n=566)}$=98.38, *p*<0.001, • second < third (mean difference 11.33%, *p*<0.001) • second < fourth (mean difference 20.82%, *p*<0.001) • third < fourth (mean difference 9.49%, *p*<0.001).

Appendix 3B

Plain language information statement and informed consent

School of Human Movement & Sport Sciences

Australian Government
Department of Health and Ageing

Prince of Wales Medical Research Institute

UNIVERSITY OF BALLARAT

PLAIN LANGUAGE INFORMATION STATEMENT and INFORMED CONSENT for PARTICIPATION

Dear Participant,

You are invited to participate in the following research project being conducted on behalf of the School of Human Movement & Sport Sciences (University of Ballarat) and the Prince of Wales Medical Research Institute (University of New South Wales).
Please take your time to read and respond to the following information.

1. PROJECT TITLE

Development of a workforce education program for exercise practitioners in falls prevention and exercise prescription for older people.

2. RESEARCHERS

Principal Researchers

School of Human Movement & Sports Science, University of Ballarat

Prof Caroline Finch	c.finch@ballarat.edu.au	Ph: (03) 53279878
Ms Deborah Pascoe	d.pascoe@ballarat.edu.au	Ph (03) 53279688

Other Senior and Associated Researchers

Prince of Wales Medical Research Institute, University of New South Wales

Prof Stephen Lord	s.lord@unsw.edu.au	Ph (02) 93991061
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School of Human Movement & Sports Science, University of Ballarat

Dr Dara Twomey	d.twomey@ballarat.edu.au	Ph (03) 53279062
Dr Peter Swan	p.swan@ballarat.edu.au	Ph (03) 53279917

3. EXPLANATION OF PROJECT

Background Information

The above researchers from the School of Human Movement & Sport Sciences (HM&SS) at the University of Ballarat and the Prince of Wales Medical Research Institute (POWMRI) invite you to participate in a study which will assist in the development of an education program in falls prevention This study forms part of a PhD conducted by Deborah Pascoe and aims to develop a workforce education program for exercise practitioners in falls prevention and exercise prescription for older adults which can be implemented into exercise science, exercise rehabilitation curriculum to enhance the learning outcomes of students in the area of falls prevention.

The study will comprise five separate stages and will require your participation in the first stage only.

Stage 1 – Survey of Human Movement / Exercise Science and Exercise Rehabilitation students to determine the level of knowledge students have with regard to older people's falls, falls risk assessment and falls prevention.

Stages 2 – 5 involve: 2. the development of a training module to address knowledge gaps based on the results of the survey in stage 1; 3. implementation of the falls prevention education module into the curriculum of Human Movement / Exercise Science and Exercise Rehabilitation courses; 4. evaluation of the education module, and; 5. finalisation of the training module for wider use in the training of Human Movement / Exercise Science and Exercise Rehabilitation professionals.

Who will take part in the research?

Students who are currently studying Human Movement / Exercise Science or Exercise Rehabilitation will be invited to take part in this research study. A representative sample of current Human Movement / Exercise Science and Exercise Rehabilitation students studying at the 2nd, 3rd or 4th year level will be asked to participate in the stage 1 survey.

Students will be invited from across six universities within Victoria and New South Wales. The survey will help determine the workforce training needs in terms of students' knowledge and awareness of issues related to falls and fall related injury and their prevention and the specific role of exercise prescription in this..

Time and Place of Study?

The survey will be administered on site at your university during the first 3 weeks of classes in second semester 2007 (23rd July to 11th August)

What will I be required to do?

You will be required to complete a survey of 17 multiple choice / true/false questions which will take approximately 10 minutes to complete. Question responses will be noted and recorded as either being correctly or incorrectly answered

What are the risks involved?

There are no risks from participation in the completion of the survey.

What are the possible benefits?

There will be no direct benefits to you or the participants who complete the stage 1 survey. However, with the development of the Training Package which will include teaching and learning materials all students involved in the study have the potential to make a difference in the area of falls prevention. The students who participate in this study will assist in making a significant contribution to falls prevention in the future.

What happens to the information gained from this study?

The stored data will identify participants by a number only. All information will be stored in a locked filing cabinet at the University of Ballarat (School of Human Movement and Sport Sciences). Following the conclusion of the study, data will be stored for at least five years, and then will be disposed of according to the requirements for disposal of research data.

What are your rights as a participant in this study?

Participation in this study is voluntary, and you may withdraw from this study at any time, without having to give a reason. Withdrawal from this study will in no way affect your relationship with the University of Ballarat researchers or staff.

Is the study approved?

This study has been approved by the University of Ballarat Human Research Ethics Committee.

Any questions regarding the project titled "Development of a workforce education program for exercise practitioners in falls prevention and exercise prescription for older people" directed to the Principal Researcher, Prof Caroline Finch, of the School of Human Movement and Sport Sciences on telephone number 5327 9878 or email c.finch@ballarat.edu.au.

If you (the participant) have any questions or concerns of this research project, please contact the Executive Officer, Human Research Ethics Committee, Research & Graduate Studies Office, University of Ballarat, PO Box 663, Mt Helen VIC 3353. Telephone (03) 5327 9765.

Appendix 4A

Specific learning objectives

Module 1 - The issue of falls: epidemiology and balance physiology

Knowledge outcomes
Understand the magnitude of the personal, social and economic cost of falls in older people.
Understand the physiology of normal ageing and the related sensorimotor impairments
Comprehend the sensory and motor contributions to balance and movement
Know and understand the medical, sensorimotor, environmental, psychosocial and demographic risk factors for falls in older people

Practical skills
Appreciate the issue of falls in older people and for society
Effectively identify clinical groups at risk of falls
Identify important sensorimotor risk factors for falls

Module 2 - The biomechanics of balance and gait

Knowledge outcomes
Understand the kinematics and kinetics of balance control and gait
Understand the central nervous system's control over biomechanical parameters for balance
Realise the consequence of changes in biomechanical variables on balance and gait

Practical skills
Measurement and analysis of human balance and gait data
Use biomechanical data to interpret and draw conclusions regarding falls risk

Module 3 – Risk assessment

Knowledge outcomes
Develop and thorough level of understanding of sensory and motor risk factors for falls
Understand and identify medical conditions and medications that predispose to falls
Become familiar with various risk assessment tools
Understand the importance of reliability and validity is falls risk assessments

Practical skills
Reliably conduct a range of sensorimotor assessments and interpret results
Reliably conduct a range of functional/mobility tests and interpret results
Choose appropriate assessment tools given different settings an client populations
Successfully identify areas for intervention from assessment results
Profile individuals and identify the risk of falls

Module 4 – Interventions – the evidence

Knowledge outcomes
Understand scientific rigor and randomised clinical trials
Be familiar with the key components of successful interventions published in the scientific literature
Interpret a meta analysis of exercise trials for falls prevention
Identify evidence for the important components of falls prevention exercise interventions

Practical skills
Critically review the scientific rigour of intervention studies
Interpret the results of a meta analysis for population health and clinical practice
Develop skills in rating evidence

Module 5 – Exercise Prescription for Falls Prevention

Knowledge outcomes
Understand the fundamental components of a falls prevention exercise program
To appreciate the need for differing formats of classes to meet individual needs for falls prevention
Identify the exercise guidelines for people aged over 65 years,
Recognise the exercise needs of people age over 65 years who are at risk of falling
Understand the need for safe exercise selection and progression for falls prevention
Understand the strategies used to identify correct level of performance on an exercise task
Understand the safe use of equipment used to prescribe exercises for falls prevention

Practical skills
Plan a graded exercise program for falls prevention
Develop a set of progressive exercises designed to improve the strength, balance, gait and mobility of people aged over 65 years
Identify incorrect exercise technique / performance and be able to instruct / teach exercises to enhance performance and skill
Apply appropriate strategies to assess person's ability to correctly perform an exercise or activity appropriate for falls prevention
Structure a fun, stimulating and safe exercise environment

Module 6 – Program Management and Practical Application

Knowledge outcomes
Understand the need for risk stratification when planning an exercise program for falls prevention
Understand the need to incorporate falls prevention exercises into all aspects of an exercise class for people aged over 65 years with chronic medical conditions or frail elderly at risk of falling
Awareness of a range of class formats, teaching styles, activity plans and equipment use to meet the objectives of falls prevention
Understand the need to modify and individualise falls prevention exercise interventions to meet the needs of clinical groups (diabetes, heart conditions, arthritis, etc.) and frail elderly
Understand professional expectations for prescribing exercise under the Medicare system and the need for appropriate referral and documentation for participants with chronic conditions

Practical skills

Effectively plan and implement a group-based exercise class targeted at falls prevention

Administer a risk stratification profile for individuals with a variety of chronic conditions participating in a falls prevention exercise program

Effectively manage participants in a group-based program to ensure optimal activity levels and safety

Manipulate the task activity, or exercise demands or the environment to provide a progressive exercise format and ensure safety

Appendix 4B

Schedule of delivery plan

Implementation Timetable - Teaching Period 1 2008

Six hour Module - Third year students HM635 – Foundations of Exercise Rehabilitation

Week 2 of Classes

		Content		Content
Monday 3/03/08	Lecture 9.30-10.30	**Module 1** Lecture (60 min) • Epidemiology • social and economic costs • overview of risk factors • physiology of balance • normal ageing • sensorimotor impairments	Laboratory (half group) 1.30-2.30	**Module 2** Lecture (15 min) • biomechanics of balance and gait Laboratory (45 min) • Sensorimotor manipulations • Biomechanical assessment
Tuesday 4/03/08	Laboratory (half group) 11.30-12.30	**Module 2** Lecture (15 min) • biomechanics of balance and gait Laboratory (45 min) • Sensorimotor manipulations • Biomechanical assessment	Lecture 1.30-2.30	**Module 3** Lecture (30 min) • More on risk factors • risk assessment tools • reliability and validity • settings, equipment Laboratory (30 min) sensorimotor assessments Functional tests

Week 3 of Classes

		Content		Content
Monday	LABOUR	DAY	HOLIDAY	
Tuesday 11/03/08	Laboratory (half group) 11.30-12.30	**Module 3** Laboratory (30 min) sensorimotor assessments Functional tests **Module 4** Lecture (30 min) › published interventions › meta-analysis of exercise trials	Laboratory (half group) 1.30-2.30	**Module 3** Laboratory (30 min) sensorimotor assessments Functional tests **Module 4** Lecture (30 min) › published interventions › meta-analysis of exercise trials

Week 4 of Classes

		Content		Content
Monday 17/03/08	Lecture 9.30-10.30	**Module 5** Lecture (60 min) › Exercise prescription › Program › Class › Exercises	Laboratory (half group) 1.30-2.30	**Module 5** Laboratory (60 min) › Exercise prescription for healthy old
Tuesday 18/03/08	Laboratory (half group) 11.30-12.30	**Module 5** Laboratory (60 min) › Exercise prescription for healthy old	Lecture 1.30-2.30	**Evaluation of Education Program**

Implementation Timetable - Teaching Period 1 2008

Nine Hour Module – Graduate Diploma students PH452 – Introduction to Exercise Rehabilitation

Week 2 of Classes

		Content	Content	
Tuesday 4/03/08	Lecture / Laboratory 8.30-11.30	**Module 1** Lecture (60 min) › Epidemiology › Social and economic costs › Overview of risk factors › Physiology of balance › Normal ageing › Sensorimotor impairments	**Module 2** Lecture (15 min) › Biomechanics of balance and gait Laboratory (45 min) › Sensorimotor manipulations › Biomechanical assessment	**Module 3** Lecture (30 min) › More on risk factors › Risk assessment tools › Reliability and validity › Settings, equipment Laboratory Part 1 (30 min) Sensorimotor assessments Functional tests

Week 3 of Classes

		Content	Content
Tuesday 11/03/08	Lecture / Laboratory 8.30-11.30	**Module 3** Laboratory Part 2 (30 min) Sensorimotor assessments Functional tests **Module 4** Lecture (30 min) › Published interventions › Meta analysis of exercise trials	**Module 5** Lecture (60 min) › Exercise prescription › Program › Class › Exercises Laboratory (60 min) › Exercise prescription for healthy old

Week 4 of Classes

		Content
Tuesday 18/03/08	Lecture / Laboratory 8.30-11.30	**Module 6** Lecture (60 min) - Program management - AAESS - Medicare - Referral Laboratory (120 min) - exercise prescription for clinical groups and frail old

Appendix 4C

Modified UniFPEP survey

School of Human Movement &Sport Sciences

Australian Government
Department of Health and Ageing

Prince of Wales Medical Research Institute

EXERCISE PRESCRIPTION FOR THE PREVENTION OF FALLS IN OLDER PEOPLE

Name of University			
Name of course			
Current year level of study			
Male ☐	Female ☐	Age (years)	

PART A - Please select only ONE response per question

1. The projected health care costs attributable to falls over the next 50 years is expected to:

☐ decrease ☐ decrease then increase ☐ remain the same ☐ increase

2. One of the most serious injuries resulting from a fall in older people is:

☐ fractured wrist ☐ dislocated shoulder ☐ sprained ankle ☐ fractured hip

3. A region of the brain that is particularly important for control of balance is:

☐ the temporal lobe ☐ the hypothalamus ☐ the cerebellum ☐ the third ventricle

4. The best exercise to prescribe a person who performs poorly on the "Timed Up and Go" test would be:

☐ Water exercise ☐ exercise bike ☐ functional task balance training ☐ seated resistance training

5. Three sensory systems important for balance are:

☐ visual, vestibular, proprioception ☐ visual, auditory, taste ☐ visual, vestibular, smell ☐ proprioception, visual, auditory

6. Most falls in older people occur due to:

☐ fainting ☐ slips and trips ☐ vertigo ☐ banana peels

7. Compared to young adults, the gait patterns of older adults generally have:

☐ increased velocity ☐ a narrower step width ☐ reduced cadence ☐ increased stride length

8. A major medical risk factor for falls in the general population is:

☐ cancer ☐ cardiovascular disease ☐ liver disease ☐ impaired cognition

9. A good predictor of falls risk is:

☐ history of falls in previous years ☐ male ☐ diabetes ☐ dizziness

10. What is the yearly rate of falls for people aged over 65 years:

☐ 1 in 3 ☐ 1 in 5 ☐ 1 in 10 ☐ 1 in 20

11. The muscle groups most important for controlling postural sway are:

☐ quadriceps, hamstrings and abdominals ☐ biceps, pectorals, peroneals ☐ ankle, dorsiflexors, hip abductors and ankle plantarflexors ☐ hamstrings, gluteals and abdominals

12. The best way to improve trip recoveries is:

- ☐ increase toe clearance in gait
- ☐ wear firmly fitting shoes
- ☐ use a walking stick
- ☐ develop lower limb power

13. What is the most common cause of serious injury in older people?

- ☐ road trauma from a car crash
- ☐ fall from a ladder during home repairs
- ☐ hip fracture from a fall
- ☐ hot water scald

14. The vestibular system:

- ☐ is housed within the middle ear
- ☐ provides information regarding head position
- ☐ provides information regarding the centre of pressure position
- ☐ includes receptors in muscles and joints

15. Which of the following is an example of multiple tasking during gait pattern variation and enhancement training?

- ☐ walking while counting backward
- ☐ walking on heels then walking on toes then walking on heels
- ☐ stepping over obstacles at various heights
- ☐ going up and down stairs

16. The centre of mass is:

- ☐ the heaviest part of the body
- ☐ the point where the resultant of all ground reaction forces act
- ☐ the point around which every particle of the body's mass is equally distributed
- ☐ the middle of the chest

17. Postural sway is:

- ☐ the deviation in head position over time
- ☐ the constant fluctuation in centre of mass position from the vertical
- ☐ the constant anteroposterior rotation of the body about a midpoint
- ☐ the constant rotation of the ankles

18. What is the worst expected outcome of a hip fracture?

- ☐ death
- ☐ hospitalisation
- ☐ bruising
- ☐ need to see a GP

19. The vestibulo-occular reflex is:

- ☐ spontaneous responses from the head in response to motion of the eyes
- ☐ opposing motion of the eyes in response to centre of mass movements
- ☐ reflex peripheral motor reactions in response to movement of the eyes
- ☐ opposing motion of the eyes in response to motion of the head

20. What exercises would best help an older adult who has a flat foot strike and often trips while walking?

- ☐ heel raises
- ☐ squats
- ☐ toe raises
- ☐ gastrocnemius stretching

21. Guidelines for developing balance training for healthy older people should follow:

- ☐ dynamic to static
- ☐ one-legged stance to two-legged stance
- ☐ multidirectional to unidirectional
- ☐ stable to unstable surfaces

22. Tai Chi exercise has been shown to be more successful in:

- ☐ community dwelling older people
- ☐ nursing home residents
- ☐ the very frail
- ☐ the very old

23. Interventions most successful for reducing falls include:

- ☐ walking program
- ☐ fitness training
- ☐ glasses (vision) modification
- ☐ balance training

24. The best method to progress a balance training programme by adding a cognitive task is to:

- ☐ provide fewer instructions while walking around an obstacle course
- ☐ counting backwards while walking around an obstacle course
- ☐ increase the level of fear or anxiety while walking around an obstacle course
- ☐ walking with bare feet around an obstacle course

25. The Otago Exercise programme is best applied to what population of older people?

- ☐ younger old
- ☐ vigorous
- ☐ hospital inpatients
- ☐ older old

PART B - Answer in the spaces provided.

26. List 3 examples of functional mobility and/or balance tests. (3 marks)

27. List 2 well demonstrated medical risk factors for falls (i.e. diseases). (2 marks)

28. List 3 well demonstrated sensory or neuromuscular risk factors for falls. (3 marks)

29. List 3 standing posture exercises in progressive order that should be used to progress balance training in older people.

30. List 3 progressions used to move from lying on the floor to standing.

31. Give 3 exercises which could be given to progress from 'sit to stand' to a free standing squat.
32. List 3 group based activities which would enhance balance.
33. How confident are you at prescribing exercises for the elderly? 0 1 2 3 4 5 6 7 8 9 10
34. How confident are you at prescribing exercises for falls prevention? 0 1 2 3 4 5 6 7 8 9 10

Appendix 4D

Assessment criteria sheet – Exercise for falls prevention laboratory

Assessment Criteria
Exercise for Falls Prevention – Laboratory

In groups of 2-3 students are to prepare a series of 4-6 exercises which address one of the following elements of exercise prescription falls prevention (balance & mobility training; strength; gait; balance & reaction time; functional activities; dual tasks; group exercises / agility training)

The 4-6 exercises / activities followed an appropriate and progressive order – easiest to more complex	0	1	2	3	4	5
Equipment was selected and used appropriately	0	1	2	3	4	5
Each exercise was clearly explained and demonstrated	0	1	2	3	4	5
Progressions within each exercise were appropriately staged / introduced	0	1	2	3	4	5
Technique was monitored and corrected	0	1	2	3	4	5
Cues / teaching points were used effectively	0	1	2	3	4	5
Safety and precautions for each exercise were emphasised	0	1	2	3	4	5
The exercises / activities were appropriate for an elderly / falls prevention class	0	1	2	3	4	5

Comments:

Appendix 4E

Assessment criteria sheet – Exercise for falls prevention class planning

Assessment Criteria
Exercise for Falls Prevention – Class Planning

In groups of 2-3 students are to prepare a targeted falls prevention class given the following set of conditions

Participants
10-12 older adults aged between 60 -80 years. Females = 7 Males = 5
5 x type 2 diabetes, 8 x overweight, 6 x OA of knees (bilateral & unilateral), 1 x THR, 1 x TKR, 2 x hypertensive, and 1 x Parkinson's.
(Obviously some participants have co-morbidities)

General considerations
Poor memory (STM), poor body awareness, hearing, vision.

Please consider the setting, equipment, class structure / format, teaching style, and individual needs.

The exercise program contained exercises / activities targeted to falls prevention	0	1	2	3	4	5
Selected class format allowed falls prevention to be the focus of the class						
Equipment was selected and used safely and appropriately	0	1	2	3	4	5
Individual needs were catered for within the structure of the class / activities	0	1	2	3	4	5
Modifications and progressions within each exercise were appropriately staged	0	1	2	3	4	5
Class was managed well to ensure safety and activity levels were optimal	0	1	2	3	4	5
Class was stimulating, fun and social	0	1	2	3	4	5

Comments:

Appendix 4F

Evaluation of falls prevention modules – year 3

Evaluation of Falls Prevention Modules – Undergraduate 3rd Years

Using the 10 point 'likert' scale please answer /rate the following:
(1 – very poor learning experience, 10 – extremely valuable / enjoyable learning experience).

1. Module 1 - Epidemiology and physiology of falls

1 2 3 4 5 6 7 8 9 10

2. Module 2 - The biomechanics of balance and gait

1 2 3 4 5 6 7 8 9 10

3. Module 3 – Risk factors and risk assessment

1 2 3 4 5 6 7 8 9 10

4. Module 4 - Research and exercise for falls prevention

1 2 3 4 5 6 7 8 9 10

5. Module 5 – Exercise prescription for falls prevention

1 2 3 4 5 6 7 8 9 10

6. Rate your enjoyment of the program

1 2 3 4 5 6 7 8 9 10

7. How satisfied are you with the content of the lecture material?

1 2 3 4 5 6 7 8 9 10

8. How relevant were the laboratory tasks

1 2 3 4 5 6 7 8 9 10

9. How interesting were the lectures

1 2 3 4 5 6 7 8 9 10

10. How interesting were the laboratories

1 2 3 4 5 6 7 8 9 10

11. How would you rate the powerpoint slide presentations

1 2 3 4 5 6 7 8 9 10

12. Was the pace of the classes appropriate for your

Not Appropriate Appropriate

1 2 3 4 5 6 7 8 9 10

1

13. Was the material

Too easy Too complex

1 2 3 4 5 6 7 8 9 10

14. Was the depth of material appropriate for your learning and future use

1 2 3 4 5 6 7 8 9 10

15. How useful were the handout materials

1 2 3 4 5 6 7 8 9 10

16. How do you rate Daina as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

17. How do you rate Deb as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

18. How relevant is this material for you in the future?

1 2 3 4 5 6 7 8 9 10

19. There was a good balance between presentation and group involvement

1 2 3 4 5 6 7 8 9 10

20. How would rate the program as an educational experience to help do your job better in the future?

1 2 3 4 5 6 7 8 9 10

21. Overall rating of the falls prevention program

1 2 3 4 5 6 7 8 9 10

Appendix 4G

Evaluation of falls prevention modules – year 4

Evaluation of Falls Prevention Modules – Post-graduate 4th years

Using the 10 point 'likert' scale please answer /rate the following: (1 – very poor learning experience, 10 – extremely valuable / enjoyable learning experience).

1. Module 1 - Epidemiology and physiology of falls

1 2 3 4 5 6 7 8 9 10

2. Module 2 - The biomechanics of balance and gait

1 2 3 4 5 6 7 8 9 10

3. Module 3 – Risk factors and risk assessment

1 2 3 4 5 6 7 8 9 10

4. Module 4 - Research and exercise for falls prevention

1 2 3 4 5 6 7 8 9 10

5. Module 5 – Exercise prescription for falls prevention

1 2 3 4 5 6 7 8 9 10

6. Module 6 – Program management and exercise prescription for falls prevention

1 2 3 4 5 6 7 8 9 10

7. Rate your enjoyment of the program

1 2 3 4 5 6 7 8 9 10

8. How satisfied are you with the content of the lecture material?

1 2 3 4 5 6 7 8 9 10

9. How relevant were the laboratory tasks

1 2 3 4 5 6 7 8 9 10

10. How interesting were the lectures

1 2 3 4 5 6 7 8 9 10

11. How interesting were the laboratories

1 2 3 4 5 6 7 8 9 10

12. How would you rate the powerpoint slide presentations

1 2 3 4 5 6 7 8 9 10

13. Was the pace of the classes appropriate for your

Not Appropriate Appropriate

1 2 3 4 5 6 7 8 9 10

14. Was the material

Too easy Too complex

1 2 3 4 5 6 7 8 9 10

15. Was the depth of material appropriate for your learning and future use

1 2 3 4 5 6 7 8 9 10

16. How useful were the handout materials

1 2 3 4 5 6 7 8 9 10

17. How useful/valuable were the quizzes to enhance your learning

1 2 3 4 5 6 7 8 9 10

18. How do you rate Daina as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

19. How do you rate Deb as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

20. How relevant is this material for you in the future?

1 2 3 4 5 6 7 8 9 10

21. There was a good balance between presentation and group involvement

1 2 3 4 5 6 7 8 9 10

22. How would rate the program as an educational experience to help do your job better in the future?

1 2 3 4 5 6 7 8 9 10

23. Overall rating of the falls prevention program

1 2 3 4 5 6 7 8 9 10

Appendix 4H

Feedback for falls prevention modules

In Groups of 2– 4 please complete the following table in relation to the Falls Prevention Modules

Components of Session	Positive Comments	Negative Comments	Recommendations
Content			
Teaching			
Powerpoint presentations			
Lecture Content			
Laboratory Activities			
Group Activities			
Equipment			
Other			

Appendix 4I

Plan for Evaluating UniFPEP

What Evaluating			How Evaluating	When Evaluating
Process Evaluation	**Is the program reaching the target group?** **Are all parts of the program reaching all parts of the target group?**		Take attendance at lectures and labs Noting if all lectures and labs were delivered	
	Are the participants satisfied with the program? **Interpersonal issues**	Do they feel comfortable in the program Are staff interested and approachable	Individual Questionnaire for participants to complete. With anonymous feedback / comments. Group / individual interview.	
	Service issues	Is the program venue convenient / appropriate to be embedded into current curriculum Costs associated with in class curriculum or workshop / professional development on weekend outside of normal university hours. Are the facilities / equipment adequate	Individual Questionnaire for participants to complete. With anonymous feedback / comments. Group / individual interview.	

	Content issues	Are the topics covered relevant? Interesting? Presented in the best way? Is the pace too slow or too fast/ Is it too complex or too easy? Are some being left not or not covered in sufficient depth?	Individual Questionnaire for participants to complete. With anonymous feedback / comments. Group / individual interview.	
		Are all the activities of the program being implemented?	Check if activities / lectures / labs happened the way they were planned / should have. Measure the content of the educational program (between classes – separate lab sessions and compare 6 hour module (third year) to 9 hour module (Grad Dip) implementation and compare if implemented with the appropriate emphasis. Process evaluation to check time on task – it is possible to get a picture of the relative stability of the session and whether or not the appropriate emphasis is being given to each topic, relative to the intention of the program.	On completion of all Modules within the Education Program After completion of each module within each program During implementation in class DP will be present at all modules and note time on task. If required discussion can take place and modifications will be made at the time of delivery or for next class if applicable
		Are all the materials and components of the program of good quality? **Assessing performance of program materials.**	Attraction – does the Powerpoint / handouts create interest? Catch peoples attention. What do people like least / most about it?	As part of overall evaluation of modules and program at the completion of the program.

			Comprehension – Are the Powerpoint slides / handouts easy to understand? Is there anything confusing about the written / handout or Powerpoint material? Acceptability – is there anything offensive or irritating in the Powerpoint slides, handout material? Does it conflict with cultural norms? Personal involvement – do the Powerpoint presentations and handouts and laboratory activities seem to be directed at the reader personally? Persuasion – is the educational material convincing? Does it seem to persuade the participant to do something?	

The above format was used to evaluate the UniFPEP for each learning module.
The same format was used for students to provide an overall evaluation of the program. This ensured evaluation within each module and for the whole program could be cross checked for consistency of feedback during the evaluation process

Appendix 5

Chapter 7: Published manuscript

Pascoe DA, Sturnieks DL, Close JCT, Tiedemann A, Lord SR, Twomey D & Finch CF. (2013). Knowledge outcomes and retention of a university-based falls prevention education program (UniFPEP). *Focus on Health Professional Education*, 15(2):55-66.

Appendix 6A

Fit+Fall=Free Invitation

School of
Human Movement
and Sport Sciences

AUSTRALIAN
ASSOCIATION FOR
EXERCISE AND
SPORTS SCIENCE

FIT + FALL-FREE – EXERCISE PRESCRIPTION & FALLS PREVENTION FOR OLDER PEOPLE

PRESENTED BY DR ANNE TIEDEMANN & DR DIANA STURNIEKS
Sponsored by University of Ballarat

This continuing education program will equip exercise professionals with important information to guide the provision of appropriate falls prevention exercise programs for older people. Topics to be covered include the social and economic issues of falls, risk factors for falls, physiological consequences of ageing, biomechanical and physiological principles of balance, and effective falls prevention strategies. Prerequisite knowledge of the principles of exercise prescription is assumed, as the program is targeted at graduates and working professionals. In undertaking the program, participants will be trained to develop safe and efficacious community exercise programs for older adults that are designed in a manner to maximise uptake and adherence of those populations who stand to most benefit from exercise. Through structured learning tasks across a number of different learning formats, participants will acquire the knowledge and ability to identify, develop, demonstrate and implement evidence-based exercise interventions designed to enhance physical and functional capacity and prevent falls and fall related injury.

This continuing education program is also linked to an innovative evaluation process that may help to guide how future education programs are best delivered. This evaluation process will determine whether the mode of delivery affects the level of knowledge and skills attained by participants during the program and the longer term relevance of these to exercise prescription practice.

This evaluation process forms part of a PhD research project being conducted by Deborah Pascoe (MAAESS, accredited exercise physiologist) at the University of Ballarat. The broader study aims to deliver and evaluate a continuing education opportunity for exercise practitioners in falls prevention and exercise prescription for older adults which will enhance the knowledge and skills of allied health professionals in the area of falls prevention. The formal evaluation will compare value of the same educational material being delivered through a typical face to face workshop style and a web-based delivery mode. It will be assumed that all participants who agree to take part in the in the 'fit+fall-free' continuing education opportunity will also consent to contributing to the evaluation process.

The 'fit + fall-free' CEO was developed, implemented, evaluated and refined in a previous project undertaken by researchers from the School of HM&SS at the University of Ballarat and the Prince of Wales Medical Research Institute and funded by the Australian Government Department of Health & Ageing Community Grants Program.

Up to 70 registrants per state will be able to participate in the 'fit+fall-free' program (20 for the 'workshop' group and 25 for each of the 'web-based' and 'delayed delivery*' groups).
(*Delayed delivery group will be conducted 6 months after initial workshop)
Each participant will be randomly allocated to one of the above 3 mentioned delivery groups

Please ensure you read the attached plain language information statement and informed consent form. If you would like to register please complete the workshop registration form and sign the informed consent form and either post or fax to the AAESS National Office. You will be notified of your workshop delivery mode once we receive your application. If you have any questions or concerns please contact the AAESS National Office.

Dr Anne Tiedemann is a postdoctoral research fellow at the Prince of Wales Medical Research Institute, Sydney, where she works in the field of falls and balance research in older people. Her PhD research concerned the development of a validated falls risk assessment suitable for use in clinical settings. Anne's areas of particular interest include risk factors for falling, the measurement of these risk factors in clinical settings and exercise for the prevention of falls in older people.

Dr Diane Sturnieks is a Senior Research Officer at the Prince of Wales Medical Research Institute and Laboratory Manager of the Falls and Balance Research Group. Diana completed a PhD at the University of Western Australia in Biomechanics, studying arthritis and gait patterns. Her current research activities are focused on understanding human balance and include various aspects of sensory and motor contributions.

Dates:	**Melbourne**	23rd November 2008	*Closing Date:*	14th November
	Sydney	30th November 2008	*Closing Date:*	14th November
	Brisbane	7th December 2008	*Closing Date:*	21st November

Time: 9am-5pm

Cost: **$110** for financial AAESS member
$55 for Student member
$175 for non members
$75 for non student members

Morning tea, lunch and afternoon tea included.

Maximum of 70 people per state so book in quick!

Registration Form for

Fit + Fall-Free Workshop

NAME: _____AAESS ID _____

ADDRESS: _____

PHONE: _____ email: _____

LOCATION: (please circle) **Melbourne** **Sydney** **Brisbane**

	Price – please circle
Member	$110.00
Non Member	$175.00
Student Member	$55.00
Student Non-Member	$75.00

Registration fee includes: Morning tea, Lunch & Afternoon tea.

This course is awarded 8 AAESS Continuing Education Points

Cancellation Policy:

You may cancel your registration without penalty or obligation by submitting to AAESS a signed and dated written notice post marked 10 working days prior to the date of your states workshop. After this date, due to the nature of this program, payment of 50% of the full non-member fee will be charged to cover expenses, including lost revenue. Cancellations made within three days of the workshop will not be refunded. If you are unable to attend for any reason you may have someone substitute for you – just call the AAESS office prior to the event on (07) 3856 5622 to advice of the change.

Payment can be made by credit card by filling in the details below or by forwarding a cheque or money order to the AAESS office: PO Box 123, Red Hill Q 4059

OR fax to (07) 3856 5688

□ ----------

CREDIT CARD PAYMENT SLIP (Please PRINT all details)

Please debit the following account in the amount of $ _____

Circle Cheque Visa Card MasterCard

Card number __ __ __ __/ __ __ __ __/ __ __ __ __/__ __ __ __

Expires: __ __/__ __

Name of Cardholder _____

Signature: _____

Confirmations will be emailed after registrations close

fit+fall-free
Exercise prescription and fall prevention for older people

This continuing education program will equip exercise professionals with background information, including the social and economic issues of falls, risk factors for falls, physiological consequences of ageing, biomechanical and physiological principles of balance, and effective falls prevention strategies. Prerequisite knowledge of the principles of exercise prescription has been assumed as the program is targeted at graduates and working professionals. In undertaking the program, participants will be trained to develop safe and efficacious community exercise programs for older adults that are designed in a manner to maximise uptake and adherence of those populations who stand to benefit from exercise. Through structured learning tasks across a number of different learning formats, participants will acquire the knowledge and ability to identify, develop, demonstrate and implement evidence-based exercise interventions designed to enhance physical and functional capacity and prevent falls and fall related injury.

Further outcomes of participation in this continuing education program will be to determine whether the mode of delivery affects the level of knowledge and skills attained by participants; and to evaluate the impact of the knowledge and skills acquired by participants in the study over the longer term

This continuing education program forms part of a PhD research project being conducted by Deborah Pascoe. The study aims to deliver and evaluate a continuing education opportunity) for exercise practitioners in falls prevention and exercise prescription for older adults which will enhance the knowledge and skills of allied health professionals in the area of falls prevention. The study will compare two different modes of delivery of the same educational material using the typical face to face workshop style and a web-based delivery.

After nominating to participate in the 'fit + fall-free' CEO participants will be randomly allocated to one of three groups: the 'web-based' group, the 'workshop' group or the 'delayed delivery' group.

The 'web-based' group will be given password-only access to the 'fit + fall-free' website which was established as part of the previous project. Participants will complete the web-based 'fit + fall-free' program independently by working through a series of lectures, laboratory tasks, and self-tests.

The 'workshop' group will attend a full day face to face workshop which will be delivered in a mix of didactic, interactive, online, and practical laboratory sessions which will contain the same educational material as offered on the 'fit + fall-free' website.

The 'delayed delivery' group will act as 'controls' for the other two delivery modes and will be directed to general information and other websites which contain freely available information on falls and falls prevention. The 'delayed delivery' group then be offered an opportunity to attend a workshop or complete the web-based format six months after the initial 'workshop' and web-based' follow-up sessions have been completed.

Immediately prior to delivery of the 'workshop' education program **all** participants from all three intervention groups will complete a baseline survey. The same survey will be administered on completion of the 'workshop' to assess immediate changes in knowledge and skills of participants.

Six months after participation in the any of the study groups all participants will be asked to again complete the survey to determine their level of retention of knowledge and skills assessed in the 'fit + fall-free' CEO. At this stage participants will also be invited to take part in a follow-up focus group to determine barriers and facilitators within the workplace to applying the knowledge and skills acquired during the 'fit + fall-free' continuing education opportunity. Members of the "delayed delivery' group will also complete the survey and be invited to participate in a focus group.

The 'fit + fall-free' CEO was developed, implemented, evaluated and refined in a previous project undertaken by researchers from the School of HM&SS at the University of Ballarat and the Prince of Wales Medical Research Institute and funded by the Australian Government Department of Health & Ageing Community Grants Program.

20 for the 'workshop' group and 25 for each of the 'web-based' and 'delayed delivery' groups

(Total of 70 at each venue)

Appendix 6B

Introduction for F2F group

fit+fall-free

School of Human Movement and Sport Sciences

Thank you for participating in the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

You have been randomly allocated to the face to face 'workshop' group

The 'workshop' group will attend a full day face to face workshop from 9.00am to 5.00pm on Sunday 30th November, 2008. The face to face workshop will be delivered in a mix of didactic, interactive, online, and practical laboratory sessions which will contain the same educational material as offered on the 'fit + fall-free' website.

Immediately prior to delivery of the 'workshop' education program all participants will complete a baseline survey. The same survey will be administered on completion of the 'workshop' to assess immediate changes in knowledge and skills of participants.

Practical skills development, as a result of the course, will be assessed for the 'workshop' group where participants will be required to develop a suitable set of exercises for a particular older adult target group. This will be presented in a group during the 'workshop' setting and the participants will be graded on the suitability of their program.

In addition to the evaluation of knowledge gain and practical skills development, there will also be a formal course evaluation undertaken. This will seek feedback from the participants on the quality of the delivered material and resources, perceived relevance of the material to their future ongoing practice and an assessment of other delivery factors.

Six months after participation all participants will be asked to again complete the survey to determine their level of retention of knowledge and skills assessed in the 'fit + fall-free' continuing education opportunity. At this stage participants will also be invited to take part in a follow-up focus group to determine barriers and facilitators within the workplace to applying the knowledge and skills acquired during the 'fit + fall-free' continuing education opportunity.

As a reminder the key aims of this research are:

- to determine if the mode of delivery of a continuing education program affects the level of knowledge and skills acquired by participants,
- to assess the level of retention of the knowledge and skills six after participation in the continuing education program, and
- to determine the barriers and facilitators to implementing the knowledge and skill acquired by participation in a continuing education program,.

Thank you for being a part of the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

Appendix 6C

Introduction for Control group

fit+fall-free

School of Human Movement and Sport Sciences

Thank you for participating in the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

You have been randomly allocated to the 'delayed delivery' group

As a participant in the 'delayed delivery' group you will act as a 'control' for the other two delivery modes. However, you will be offered the choice of either attending a workshop or completing the web-based format in six months time (May-June 2009).

As a participants in the 'delayed delivery' group it is a requirement that you complete a pre-test survey immediately prior to downloading general falls education material and websites information from the 'fit+fall-free" website. This will be made available to you from 5.00pm Friday 21st November, 2008.

The same survey will need to be completed as part of post-testing, no later than 5.00pm Monday 8th December, 2008.

In addition to the evaluation of knowledge gain and practical skills development, there will also be a formal course evaluation undertaken. This will seek feedback from the participants on the quality of the delivered material and resources, perceived relevance of the material to their future ongoing practice and an assessment of other delivery factors.

Six months after participation all participants will be asked to again complete the survey to determine their level of retention of knowledge and skills assessed in the 'fit + fall-free' continuing education opportunity. At this stage participants will also be invited to take part in a follow-up focus group to determine barriers and facilitators within the workplace to applying the knowledge and skills acquired during the 'fit + fall-free' continuing education opportunity.

By fulfilling all requirements of the 'delayed delivery' participation group you are assured of future participation in either the face to face workshop or online version of the 'fit+fall-free' program.

As a reminder the key aims of this research are:

- to determine if the mode of delivery of a continuing education program affects the level of knowledge and skills acquired by participants,
- to assess the level of retention of the knowledge and skills six after participation in the continuing education program, and
- to determine the barriers and facilitators to implementing the knowledge and skill acquired by participation in a continuing education program,.

Thank you for being a part of the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

Appendix 6D

Introduction for Online group

fit+fall-free

School of Human Movement and Sport Sciences

Thank you for participating in the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

You have been randomly allocated to the online 'web-based' group

The 'web-based' group will be given password-only access to the 'fit+fall-free' website which was established as part of a previous project. Participants will complete the web-based 'fit + fall-free' program independently by working through a series of lectures, laboratory tasks, and self-tests.

As a participant in the 'web-based' group it is a requirement that you complete a pre-test survey immediately prior to gaining access to the 'fti+fall-free' website. The 'fit+fall-free' website contains nine progressively staged learning modules which contain, lectures, laboratory tasks, self-quizzes, recommended readings and additional general falls education material and website information which can be viewed and/or downloaded from the 'fit+fall-free' website. Access will be made available to you from 5.00pm Friday 5th December, 2008.

After completion of the all the website materials the same survey will need to be completed as part of post-testing, no later than 5.00pm Monday 22nd December, 2008.

In addition to the evaluation of knowledge gain and practical skills development, there will also be a formal course evaluation undertaken. This will seek feedback from the participants on the quality of the delivered material and resources, perceived relevance of the material to their future ongoing practice and an assessment of other delivery factors.

Six months after participation all participants will be asked to again complete the survey to determine their level of retention of knowledge and skills assessed in the 'fit + fall-free' continuing education opportunity. At this stage participants will also be invited to take part in a follow-up focus group to determine barriers and facilitators within the workplace to applying the knowledge and skills acquired during the 'fit + fall-free' continuing education opportunity.

As a reminder the key aims of this research are:

- to determine if the mode of delivery of a continuing education program affects the level of knowledge and skills acquired by participants,
- to assess the level of retention of the knowledge and skills six after participation in the continuing education program, and
- to determine the barriers and facilitators to implementing the knowledge and skill acquired by participation in a continuing education program,.

Thank you for being a part of the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

Appendix 6E

Instructions for Online group access

fit+fall-free

School of Human Movement and Sport Sciences

As a participant in the 'web-based' group it is a requirement that you complete a pre-test survey immediately prior to gaining access to the 'fti+fall-free' website. The 'fit+fall-free' website contains nine progressively staged learning modules which contain, lectures, laboratory tasks, self-quizzes, recommended readings and additional general falls education material and website information which can be viewed and/or downloaded from the 'fit+fall-free' website.

Access will be made available to you from 5.00pm Friday 5th December, 2008.

After completion of the all the website materials the same survey will need to be completed as part of post-testing, no later than 5.00pm Monday 22nd December, 2008.

The evaluation and post-test survey will not be available until after 5.00pm on Monday 15th December. **Access details will be forwarded to you on Monday 15th December.** This is to ensure that participants have allowed time for access to the 'web-based' material.

When completing the pre, post-tests and evaluation information participants must use their four digit AAESS ID number. This will be used for matching pre/post tests and contact via AAESS for the six month follow-up. Participants can choose to include their name, but this will remain confidential throughout the entire project.

You need to fulfil all requirements of the 'web-based' participation group to ensure your future participation in the 'fit+fall-free' program and to gain full CEP points through AAESS.

Thank you for being a part of the 'fit+fall-free' exercise prescription and fall prevention for older people continuing education opportunity.

To gain access to the pre-test for the 'fit+fall-free' website please click on the link below.
If this does not work copy and paste into the URL address

fit-fall-free.com.au

username: **quiz**
password: **XXXXX**

Following completion of the pre-test please use the following username and password to gain full access to the 'fit+fall-free' web-based material.

username: **course**
password: **XXXXX**

Appendix 6F

Websites for Control group

fit+fall-free
Exercise prescription and fall prevention for older people

Web-based Resources

Validated Falls Risk Assessments

PPA – Physiology Profile Assessment (Lord, et al Phys Therapy,2003)
http://www.powmri.edu.au/fallsnetwork/Falls%20network%202008_Tiedemann.pdf

FallScreen – the falls risk calculator
http://www.powmri.edu.au/FBRG/default.htm

Quickscreen clinical falls risk assessment tool (Tiedemann, 2006)
http://www.powmri.edu.au/FBRG/default.htm

Tinetti Balance test (Tinetti, J Am Geriatr Soc.1986)
http://www.bhps.org.uk/falls/documents/TinettiBalanceAssessment.pdf

Senior fitness test (Rikli & Jones,i 2001)
http://www.icaa.cc/Journal%20on%20Active%20Aging/Journalarticles/Journalarticles2/measuringfunctionalfitness2.pdf

Berg Balance Scale (Berg et al Can J Public Health, 1992)
http://contracts.oaccac.on.ca/bpp/strokestrategy/images/pdf/bergscale.pdf

ABC confidence scale (Powell & Myers, J Geron,1995)
http://biomed.gerontologyjournals.org/cgi/content/abstract/53/4/M287

http://www.injuryresearch.bc.ca/Publications/Repository/Activities-specific%20Balance%20Confidence%20Scale.pdf

Fall Reduction Community Examples

No Falls - Victoria; (Day et al, BMJ 2002)
http://www.monash.edu.au/muarc/projects/nofalls/index.html

Steady Steps – Queensland
http://www.fitness4u.net.au/index.php?page=Steady-Steps

Upright and Active – NSW
http://www.sportwaikato.org.nz/main.cfm?id=38

Stay on Your Feet - Western Australia
http://www.stayonyourfeet.com.au

Otago Exercise Program – New Zealand
http://www.acc.co.nz/injury-prevention/home-safety/older-adults/otago-exercise-programme/index.htm

Better Balance – NSW
http://esrc.uow.edu.au/betterbalance.html

Exercise Programs

Strength Training examples

Living longer – Living Stronger
http://www.dva.gov.au/health/health_wellbeing/living_longer.htm

Staying Active Staying Strong
http://www.nscchealth.nsw.gov.au/services/healthprom/whatsnew/SASSResearch1_2004.pdf

Individual Home examples

Otago Exercise Program
http://www.acc.co.nz/injury-prevention/home-safety/older-adults/otago-exercise-programme/index.htm

Staying Active - Staying Safe
(http://www.health.nsw.gov.au/public-health/phb/HTML2002/janfeb02html/sactive.html

Older Adult Community program examples

Active over 50's
http://www.kiama.nsw.gov.au/Commercial-Activities/leisure-centre/active-over-50s.html

Government Departments / Organisations

National Injury Prevention Plan: 2004-2014 (July 2005)
http://www.dhs.vic.gov.au/nphp/publications/sipp/nipspp.pdf

National Falls Prevention for Older People Plan: 2004 Onwards (July 2005)
http://www.dhs.vic.gov.au/nphp/publications/sipp/fallplan.pdf

Department of Health and Ageing – Don't fall for it. Falls can be prevented!
http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-pub-injury-dontfall-cnt.htm

Stay on your feet – your home safety checklist – NSW Department of Health
http://www.health.nsw.gov.au/pubs/2003/stay_on_feet.html

Falls Prevention – Health insite
http://www.healthinsite.gov.au/topics/Falls_Prevention

Falls prevention in Older People
http://www.health.qld.gov.au/fallsprevention/

Falls Prevention - Health and well being: Aged Care in Victoria
http://www.health.vic.gov.au/agedcare/maintaining/falls/index.htm

Falls Prevention for Older Persons – resources
http://www.fallsprevention.org.au/resources.htm

NSW Falls Injury Prevention Network
http://www.powmri.edu.au/fallsnetwork/

Prince of Wales Medical Research Institute – Falls and Balance Research Group
http://www.powmri.edu.au/FBRG/default.htm

Australian falls related publications 2000-2005
http://www.powmri.edu.au/fallsnetwork/Australian%20Falls%20Related%20Publications%20Topic[2].pdf

Exercise for Osteoporosis and Falls Prevention
http://www.osteoporosis.org.au/files/factsheets/OTH-7675-ENG.pdf

Arthritis Victoria – Exercise for Osteoporosis and Falls Prevention
http://www.arthritisvic.org.au/pages.asp?d=5A4C5A717251477C7008060D0F0403

New Zealand

New Zealand – Preventing Injury from Falls Strategy
http://www.acc.co.nz/injury-prevention/falls-prevention-strategy/index.htm

Appendix 7A

Evaluation for Control group

fit+fall-free

Exercise prescription and fall prevention for older people

Delayed Delivery Evaluation Questionnaire

AAESS ID Number: _____

Please rate the following

1. Quality of the websites

   1 2 3 4 5 6 7 8 9 10

2. User friendliness of website

   1 2 3 4 5 6 7 8 9 10

3. Quality of the material contained on the website

   1 2 3 4 5 6 7 8 9 10

4. Usefulness of website material

   1 2 3 4 5 6 7 8 9 10

5. Relevance of website material

   1 2 3 4 5 6 7 8 9 10

6. Downloadable materials available on the websites

   1 2 3 4 5 6 7 8 9 10

7. Relevance for exercise prescription for the elderly

   1 2 3 4 5 6 7 8 9 10

8. Relevance for exercise prescription for falls prevention

   1 2 3 4 5 6 7 8 9 10

9. Relevance for exercise professionals (exercise physiologists)

   1 2 3 4 5 6 7 8 9 10

Please answer the following

10. Estimate how many websites you opened?

11. Estimate how many websites you downloaded material from?

12. Which of the nominated websites do rate the best / most relevant for exercise prescription for falls prevention?

13. State your favourite / best / recommended website for exercise prescription advice?

14. Nominate your best exercise prescription text / source of information / material for exercise prescription for the elderly?

15. Nominate your best exercise prescription text / source of information / material for exercise prescription for falls prevention?

16. How has your participation in this continuing education program helped your future prescription of exercise for the elderly?

17. How has your participation in this workshop helped your future prescription of exercise for falls prevention?

Any other comments?

Appendix 7B

Evaluation for Online group

Evaluation of Falls Prevention Modules

Using the 10 point 'likert' scale (1 poor – 10 excellent)
Please answer /rate the following:

1. Module 1 - The issue of falls in older people

1 2 3 4 5 6 7 8 9 10

2. Module 2 - The physiology of balance

1 2 3 4 5 6 7 8 9 10

3. Module 3 – The biomechanics of balance, gait and falls

1 2 3 4 5 6 7 8 9 10

4. Module 4 - Falls risk assessment

1 2 3 4 5 6 7 8 9 10

5. Module 5 – Evidence for falls prevention interventions

1 2 3 4 5 6 7 8 9 10

6. Module 6 – Exercise prescription for older people

1 2 3 4 5 6 7 8 9 10

7. Module 7 – Exercise prescription for falls prevention

1 2 3 4 5 6 7 8 9 10

8. Module 8 – Exercise prescription for falls prevention: program management and practical application

1 2 3 4 5 6 7 8 9 10

9. Module 9 – Medical conditions and exercise prescription for fall prevention

1 2 3 4 5 6 7 8 9 10

10. Rate your enjoyment of the program

1 2 3 4 5 6 7 8 9 10

11. How satisfied are you with the content of the lecture material?

1 2 3 4 5 6 7 8 9 10

12. How relevant were the laboratory tasks

1 2 3 4 5 6 7 8 9 10

13. How interesting were the lectures

1 2 3 4 5 6 7 8 9 10

14. How interesting were the laboratories

1 2 3 4 5 6 7 8 9 10

15. How would you rate the quality of the lecture presentations

1 2 3 4 5 6 7 8 9 10

16. Was the format of the modules appropriate for your learning

Not Appropriate Appropriate

1 2 3 4 5 6 7 8 9 10

17. Was the material

Too easy Too complex

1 2 3 4 5 6 7 8 9 10

18. Was the depth of material appropriate for your learning and future use

1 2 3 4 5 6 7 8 9 10

19. How useful were the downloadable materials in general

1 2 3 4 5 6 7 8 9 10

20. How useful were the video/lectures

1 2 3 4 5 6 7 8 9 10

21. How useful were the podcast downloads

1 2 3 4 5 6 7 8 9 10

22. How useful were the pdf lecture slides handouts

1 2 3 4 5 6 7 8 9 10

23. How useful/valuable were the quizzes to enhance your learning

1 2 3 4 5 6 7 8 9 10

24. How useful/relevant were the recommended readings

1 2 3 4 5 6 7 8 9 10

25. How useful/relevant were the additional resources / web links

1 2 3 4 5 6 7 8 9 10

26. How relevant is this material for you in the future?

1 2 3 4 5 6 7 8 9 10

27. There was a good balance between presentations and individually paced learning

1 2 3 4 5 6 7 8 9 10

28. How would rate the program as an educational experience to help do your job better in the future?

1 2 3 4 5 6 7 8 9 10

29. Overall rating of the 'Web-based' 'fit+fall-free' falls prevention program

1 2 3 4 5 6 7 8 9 10

Appendix 7C

Evaluation for F2F group

Evaluation of Falls Prevention Modules

Using the 10 point 'likert' scale (1 poor – 10 excellent) please answer /rate the following:

1. Module 1 - The issue of falls in older people

1 2 3 4 5 6 7 8 9 10

2. Module 2 - The physiology of balance

1 2 3 4 5 6 7 8 9 10

3. Module 3 – The biomechanics of balance, gait and falls

1 2 3 4 5 6 7 8 9 10

4. Module 4 - Falls risk assessment

1 2 3 4 5 6 7 8 9 10

5. Module 5 – Evidence for falls prevention interventions

1 2 3 4 5 6 7 8 9 10

6. Module 6 – Exercise prescription for older people

1 2 3 4 5 6 7 8 9 10

7. Module 7 – Exercise prescription for falls prevention

1 2 3 4 5 6 7 8 9 10

8. Module 8 – Exercise prescription for falls prevention: program management and practical application

1 2 3 4 5 6 7 8 9 10

9. Module 9 – Medical conditions and exercise prescription for fall prevention

1 2 3 4 5 6 7 8 9 10

10. Rate your enjoyment of the program

1 2 3 4 5 6 7 8 9 10

11. How satisfied are you with the content of the lecture material?

1 2 3 4 5 6 7 8 9 10

12. How relevant were the laboratory tasks

1 2 3 4 5 6 7 8 9 10

13. How interesting were the lectures

1 2 3 4 5 6 7 8 9 10

14. How interesting were the laboratories

1 2 3 4 5 6 7 8 9 10

15. How would you rate the powerpoint slide presentations

1 2 3 4 5 6 7 8 9 10

16. Was the pace of the classes appropriate for your learning

Not Appropriate Appropriate

1 2 3 4 5 6 7 8 9 10

17. Was the material

Too easy Too complex

1 2 3 4 5 6 7 8 9 10

18. Was the depth of material appropriate for your learning and future use

1 2 3 4 5 6 7 8 9 10

19. How useful were the handout materials

1 2 3 4 5 6 7 8 9 10

20. How useful/valuable were the quizzes to enhance your learning

1 2 3 4 5 6 7 8 9 10

21. How do you rate Daina as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

22. How do you rate Anne as a teacher / presenter

1 2 3 4 5 6 7 8 9 10

23. How relevant is this material for you in the future?

1 2 3 4 5 6 7 8 9 10

24. There was a good balance between presentation and group involvement

1 2 3 4 5 6 7 8 9 10

25. How would rate the program as an educational experience to help do your job better in the future?

1 2 3 4 5 6 7 8 9 10

26. Overall rating of the falls prevention program

1 2 3 4 5 6 7 8 9 10

Appendix 7D

Group evaluation for F2F group

In Groups of 2– 4 please complete the following table in relation to the 'fit+fall-free continuing education opportunity

Components of Session	Positive Comments	Negative Comments	Recommendations
Content			
Teaching			
Powerpoint slides / presentation			
Lecture Content			
Laboratory Activities			
Group Activities			
Equipment			
Handout materials			
Testing and evaluation			
Other			

Appendix 8

6-month post evaluation

Questions 1–8 require you to complete answers with regard to the three time periods used for testing as follows:

PRE – prior to completing the fit+fall-free program
POST – immediately after completing the fit+fall-free program
NOW – over 6 months after completing the fit+fall-free program

1. Your level of knowledge of falls risk?

	No knowledge									Excellent knowledge
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

2. Your level of knowledge of falls risk assessments?

	No knowledge									Excellent knowledge
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

3. Your level of knowledge of falls prevention strategies?

	No knowledge									Excellent knowledge
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

4. Your level of knowledge of exercise prescription for older people?

	No knowledge									Excellent knowledge
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

5. Your level of knowledge of exercise prescription for falls prevention?

	No knowledge									Excellent knowledge
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

6. How would you rate your skills for prescribing exercises for older people?

	No skills									Excellent skills
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

7. How would you rate your ability to prescribe exercises for falls prevention?

	No skills									Excellent skills
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

8. How would you rate your skill to assess falls risk?

	No skills									Excellent skills
PRE	1	2	3	4	5	6	7	8	9	10
POST	1	2	3	4	5	6	7	8	9	10
NOW	1	2	3	4	5	6	7	8	9	10

9. What were your primary reason(s) for your participation in the fit+fall-free Program? (tick all that apply).

- ☐ Gain AAESS CEP points
- ☐ Requirement of current work role
- ☐ To learn more about falls prevention
- ☐ To learn about fall risk assessment
- ☐ Would like to incorporate falls prevention into my workplace
- ☐ To help with working with older people
- ☐ To help with working in the area of falls prevention
- ☐ Other (please note below)

_____

_____

10. How have you applied the knowledge and skills you learnt during the fit+fall-free program?

- ☐ Started an exercise for falls prevention class
- ☐ Incorporated falls risk assessments into my work
- ☐ Incorporated exercises for falls prevention into my exercise prescription
- ☐ Other (please note below)

_____

_____

11. How much have the knowledge and skills learnt during the fit+fall-free program made an impact on your work practices?

Not much								Extremely	
1	2	3	4	5	6	7	8	9	10

12. Following your participation in the fit+fall-free program, how motivated were you to adopt the content?

Not very								Extremely	
1	2	3	4	5	6	7	8	9	10

13. To what extent have you applied your knowledge and skills of falls risk assessment?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10

14. To what extent have you applied your knowledge and skills of exercise prescription for older people?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10

15. To what extent have you applied your knowledge and skills of exercise prescription specifically for falls prevention?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10

16. If you have applied the knowledge and skills learnt during the fit+fall-free program, what factors *enabled* you to implement these? (tick all that apply)

- ☐ Your motivation / determination
- ☐ Requirement of current work role
- ☐ Your workplace setting
- ☐ Funding
- ☐ Support from work colleagues
- ☐ Easy to incorporate into current work practices
- ☐ Other (please note below)

_____

_____

17. If you have NOT applied the knowledge and skills learnt during the fit+fall-free program, what factors *prevented* you from implementing them? (tick all that apply)

- ☐ Your motivation / determination
- ☐ Not a requirement of current work role
- ☐ Not easy to incorporate into current work practices
- ☐ Your workplace setting
- ☐ Costs for program set-up
- ☐ Costs for participants
- ☐ Lack of support from work colleagues
- ☐ Other (please note below)

_____

_____

Appendix 9

Interview questions

Focus Group Questions

1. Introduction

2 Questions to tap contextual information

3. Questions to tap the key information required

4. Probe questions for follow-up or to elicit more specific information

Contextual information
Prior to participation how would you rate the following:

A. Awareness of the problem and the need to change

1. Your knowledge / awareness of falls, falls risk and falls prevention strategies?

No awareness Very aware
1 2 3 4 5 6 7 8 9 10

2. Knowledge of exercise prescription for the elderly?

No knowledge Excellent knowledge
1 2 3 4 5 6 7 8 9 10

3. Knowledge of exercise prescription for falls prevention

No knowledge Excellent knowledge
1 2 3 4 5 6 7 8 9 10

B. Motivation to make a change

4. Outline your primary reason(s) for your participation in the fit+fall-free continuing education opportunity?

C. Skill development to prepare for the change

5. How would you rate your knowledge of falls prevention

Pre-particpation

No knowledge Excellent knowledge

1 2 3 4 5 6 7 8 9 10

Post
Now (over 6 months later)

How would you rate your ability to prescribe exercises for older people

How would you rate your ability to prescribe exercises for falls prevention

How would you rate your ability to assess falls risk

4. Initial adoption of the new activity or behaviour, and

Following participation in fit+fall-free how motivated were you to adopt some of the

Not very Extremely

1 2 3 4 5 6 7 8 9 10

How have you used / applied the knowledge and skills learned from the fit+fall-free continuing education opportunity?

5. Maintenance of the new activity and integration into lifestyle

To what extent have you applied / used what you learned from fit+fall-free

No extent Large extent

1 2 3 4 5 6 7 8 9 10

To what extent did you intent to apply / use what you learned from fit+fall-free

No extent Large extent

1 2 3 4 5 6 7 8 9 10

To what extent did external conditions (beyond your control) facilitate you implementing what you learned from fit+fall-free

No extent Large extent

1 2 3 4 5 6 7 8 9 10

Please note the conditions which facilitated your implementation

To what extent did external conditions (beyond your control) inhibit you implementing what you learned from fit+fall-free

No extent Large extent

1 2 3 4 5 6 7 8 9 10

Please note the conditions which facilitated your implementation

If you are not using some of the falls risk assessments or exercise prescription strategies from the fit+fall-free program, why not?

If you are not using some of the falls risk assessments or exercise prescription strategies from the fit+fall-free program, why not?

Did you confront any barriers to you being able use / apply the knowledge and skills

To what extent did you plan to do things differently?

To what extent do you believe that falls prevention is an important part of an exercise professional role?

No extent Large extent

1 2 3 4 5 6 7 8 9 10

To what extent do you believe you have been inhibited in implementing or using aspects of falls prevention in your current exercise professional role?

No extent Large extent

1 2 3 4 5 6 7 8 9 10

What type of inhibitors did you encounter?

To what extent do you believe you have been facilitated in implementing or using aspects of falls prevention in your current exercise professional role?

No extent Large extent

1 2 3 4 5 6 7 8 9 10

What type of facilitators did you encounter?

How could the program better suit your needs?

Following participation in the fit+fall-free program

To what extent did you use falls risk assessment?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10

To what extent have you been able to use exercise prescription for older people?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10

To what extent did you use exercise prescription specifically for falls prevention?

No extent								Large extent	
1	2	3	4	5	6	7	8	9	10