Final Report to the Ontario Neurotrauma Foundation

Best Practices in the Prevention of Mid-life Falls in Everyday Activities

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**Objective:** To provide case studies of new and previously identified best practices in the prevention of mid-life falls, deliver a literature review in this area, and identify potential members of an advisory community of practice (program implementers and researchers).

**Rationale:** Falls are a significant public health problem that is increasingly being addressed by community-based interventions. Until recently, research in the field of fall prevention has focused on our aging population, and little attention has been given to mid-life adults. This is currently an understudied and neglected area in public health: unintentional injury in this age group represents a significant financial burden to our health care system, as well as a considerable social burden, given the interference with work and family. As an emerging area of interest, identifying and implementing best practice interventions with the aim of preventing falls in mid-life.

**Timeline:** February 1, 2013- August 1, 2014
Stages of the project the review and casing of exemplary practices

- **Stage I February, 2013**
  Form a consultation group/advisory community of practice comprised of Ontario Injury Prevention Managers, researchers, and other falls prevention stakeholders to help expand and adapt the BRIO framework by adding questions and participating in a survey of stakeholder information needs.

- **Stage II November 2013**
  Receive input from these stakeholders to feed into the ongoing literature and case review process and make necessary modifications.

- **Stage III August 2014**
  Finalize the review and BRIO case studies of annotated and new best practices for dissemination.
Background

The casing of best practice programs to prevent mid-life falls presented here is built around the utilization of a four-phased approach to examining falls in mid-life that employs systematic reviews, case studies, multi-method evaluation research, and the fostering of communities of practice to promote the eventual achievement of significant reduction in the incidence of mid-life falls in everyday (non-work and sport-related) activities. This approach builds on the over 100 severe injury prevention programs that have already been cased and constitute an important documentation of some of the world’s best efforts to prevent serious injury. This approach recognizes that evidenced-informed implementation research is a complex process dependent on context and the involvement of multi-level interactions between an array of individuals, groups, and organizations.

The Language of Best (Exemplary) Practices (Programs)

One of the lessons learned from previous reviews of best practice is that our work and the selection criteria we employ are more about casing exemplary programs than best practices. Along with this realization is an appreciation that programs are constellations of practices that become organized, rationalized, and labeled.

Adopting this view has given evidence a place among our selection criteria that is realistic and balanced. The case studies that have resulted from our review process are program descriptions that should enable decision makers to make well-informed decisions. We have also taken what we consider to be a more realistic and practical approach to the labeling of programs by describing them as exemplary/promising as
opposed to best/innovative. The idea of a compilation of cases is based on the observation from previous casebooks in the prevention of head and spinal cord injury that carefully documented case histories can provide excellent guidelines for policy-making and for planning new initiatives. Documenting exemplary programs is a valuable source of knowledge because the cases provide alternative solutions that can improve decisions made by policy-makers and practitioners by providing them with deeper insight into aspects of community participation. If cases studies are held up as examples and sources of inspiration, adaptations and implementations can be planned and based on what works in practice.

In gathering this information, we extensively go into the details of each practice. We focus on the ways that the practice has been adapted and applied, as well as the way the knowledge is transferred and disseminated. Calling programs “exemplary” suggests that they can be adapted; that useful ideas can be generated from them, and that they can contribute positively to both policy and practice. In contrast, designating a program as a best practice implies that the programs surveyed were in a hierarchical competition.

The designation exemplary was also important because although our review process has been systematic and as comprehensive as possible, it does not seem appropriate to describe the programs that did get cased as “best”. Throughout our review, we use the terms best and exemplary interchangeably, as it remains the convention to us the term “best practice” to describe the work.
Advisory Community of Practice

Another lesson we learned in implementation is that practitioners needed to adapt programs to local capacities and contexts. In recognition of this we established an advisory community of practice in the nomination phase described below to consider issues of knowledge transfer, selection criteria, and to create a dialogue between stakeholders. An advisory community of practice is often defined as a group of people who come together, either virtually or in person, around a topic. Here we refer to this group as advisory community of practice stakeholders who interacted with the project team and one another. This advisory community of practice is comprised of the likely program implementers, research knowledge generators, and policy makers. This grouping is a valuable resource in supporting the use of the cases generated by the review and has helped build a sense of trust among community members. One consequence of the creation of the advisory community of practice was an exchange of knowledge that has contributed to the development of a culture of sharing around the cased exemplars. This process was important for assessing implementation readiness and increasing the probability that positive changes can be sustained.

Practitioners were also able to educate researchers with their practice knowledge and to help transfer practice-based evidence. This is important because changing practice situations is much more than adopting evidenced-based recipes. Knowledge transfer is a translation process that cannot be extracted or isolated from the practice situation. This innovative feature of the research reported here is a potentially important contribution to better understanding of knowledge mobilization and program implementation.
Rationale for Examining and Casing Efforts to Prevent Adults from Falling

Falls are one of the most serious health problems across the life span. In Canada falls are the leading source of overall injury costs. They account for half of all injuries leading to hospitalization and are the leading cause of permanent and partial disability (SMARTRISK, 2009). They account for three times the hospitalizations of any other mechanism of injury. Although falls substantially impact all age groups, they particularly impact the young and the old. For this reason most attention to this problem has focused on children and the elderly. What little research that exists on adults has examined falls-related injuries in the workplace and in competitive sports. To date, little consideration has been given to falls in young, middle, and older adults in everyday activities and on ice and snow. The recent Ontario Injury Data Report (Ontario Injury Prevention Resource Centre (OIPRC), 2013) indicates that this is a grave oversight. Emergency Room and Hospital visits caused by falls begin to rise in the 25-34 age group and reach a high point in the 45-54 age group that is only exceeded by individuals 80 and older. Moreover, falls prevention that begins in mid-life may have a ripple effect and help prevent falls in later life.

Ontario Public Health Units are mandated to address falls prevention across the life span. They are challenged to implement and sustain best practices. These units differ significantly in terms of their planning and adapting of falls prevention programs. The review and casing presented here aims to help mobilize information about the world’s best efforts to prevent mid-life falls in everyday activities and to increase the capacity of public health units and co-operating partners/agencies to implement and deliver adapted effective falls-prevention programs.
Review Process

To date there has not been a comprehensive critical review of the risk and protective factors, coupled with fall prevention practices that have proven to be effective in dealing with falls, for adults aged 25 to 60. A fall occurs when a person descends by the force of gravity and comes into contact with the ground or other object at a lower level. This review focused on falls from heights, on level ground, and on stairs. Falls have been documented as one of the leading causes of injury related hospitalization (Health Canada, 2002). Understanding the risk and protective factors associated with injuries due to falls is complicated. To ensure that decision-making associated with falls prevention is based on the best available knowledge, we employed a systematic multi-stage and multifaceted process to examine what constitutes knowledge in this area.

Incidence and literature Review Strategy

The purpose of the literature review was to support evidence-based practice (strategies/interventions) by encouraging systematic assessment of reports of research, to see which ones can inform “effective practice” in the prevention of falls. A review becomes a systematic review when research studies reach specific standards in terms of methodology and the reviewer is explicit about how the studies were located and what exclusion and inclusion criteria were used.

The search strategy employed in this review involved a multi-faceted mining of every available literature source. Using previously developed procedures for finding and recording findings the following sources were tapped (Volpe et. al. 2002):

- Medline, PsycARTICLES, and other relevant bibliographic database
• Cochrane controlled clinical trials register

• Foreign language literature

• “Grey literature” (unpublished or un-indexed reports: theses, conference proceedings, internal reports, non-indexed journals, pharmaceutical industry files)

• Reference chaining from any articles found

• Personal approaches to experts in the field to find unpublished reports

• Hand searches of the relevant specialized journals

Literature was further selected based on its ability to provide information on (a) the risk factors for slips, trips and falls in everyday life/environments; (b) investigations and evaluations on guidelines and interventions that focus on decreasing injury in non-sport, non-healthcare and non-occupational risks/environments; and (c) research and evaluations on slips, trips and falls for the age range of 20–64.

The current literature review also drew from secondary sources available through the University of Toronto Library online database, Scholars Portal with literature also accessed through Google™ and Google Scholar™. The sources derived from Scholars Portal and Google Scholar™ were academic and peer reviewed literature, which provided an epidemiological context about safety culture in healthcare centres, as well as an overview of the systematic evaluations available for safety culture and prevention programs within healthcare settings. Searching on Google™ provided access to information about the intervention programs themselves from standpoint of the institutions implementing them and the organisations that supported them.

The establishment of the final grounds for the inclusion and exclusion of literature
pertaining to risk and protective factors associated with mid-life falls were carried out in consultation with falls prevention experts. What follows is an appraisal format that has been proven useful in previous reviews that is applicable to both experimental (random control trial) and quasi-experimental research reports. Because of the importance of mixed method research to health promotion a similar protocol has been developed for survey, qualitative, synthetic (systematic), and meta-analytic investigations.

The appraisal process can be divided into three sections:

I. Relevance: Does the article deal with factors that contribute to understanding the risk and protective factors associated with falls? What is the contribution to prevention science?

II. Soundness: Are the conclusions justified by the description of the methodology and the findings?

There are three sets of screening questions:

1. Did the study address a clearly focused issue?

2. How was the sample selected? Is it big enough (power calculation), and is it representative? Was the assignment of subjects to treatments randomized? Were all the subjects who entered the study properly accounted for at its conclusion? Are there any differences between the two groups in terms of selection bias or confounding variables, which could explain the differences between them (e.g., age, sex, and social class)? Were the groups similar at the start of the trial (i.e., in terms of age, sex and any confounding
variables)? Were the groups treated equally? Were the subjects “blind to the
treatment?

3. What are the results?

How large was the treatment effect? (What outcomes were recorded and
how the differences between the groups were expressed?)

How precise was the estimate of the treatment effects?

III. Usefulness: Can the finding be generalized to most adults? Are the risk and
protective factors like similar to those present in the lives of Canadians? Can the
results be applied to the local population? Were all the important outcomes
considered? (If any were neglected, does this affect the interpretation?)

Are the benefits worth the harms and costs?

Exemplary Programs Review Methodology

To gauge and identify exemplary programs, we employed a multi-phase process.
Information for the review was gathered by interviewing program representatives face-to-
face, by telephone and the Internet. Further collection of information was obtained from a
variety of methods developed in previous reviews that are described in the following
three phases. Phase 1 outlines the tangible steps taken to establish case selection and
identify possible best practices. Phase 2 describes the data gathering methods employed
throughout the course of the research that follow the BRIO Model; also included here is
an outline of the case analysis framework based on the complex systems conceptual
scheme of human development research known as the Life Space Framework. Lastly,
Phase 3 establishes the final set of criteria used to identify chosen programs as “Exemplary”.

**Phase 1: Steps to Identify Best Practices**

**Investigation**

Various search tools were utilized to provide a broad picture of mid-life falls prevention on a global level and which include a meta-search of the World Wide Web, academic literature reviews, nominations from consortium members and partners, and legislative and regulatory information. Specifically, Meta searches on the web enabled us to access relevant worldwide information. A literature review of systematic databases (outlined above) provided valuable meta-analysis of effective mid-life falls prevention. National centres for rehabilitation and mid-life falls prevention research acted as information resources regarding mid-life falls prevention practices on national levels.

Referrals were garnered through literature reviews and key informants. Based on past experiences in the evaluation of best practices for other projects, we have learned that knowledge of unpublished yet worthwhile programs is often gained by networking with program personnel.

Systematic reviews were obtained from the relevant published and unpublished reports in an effort to uncover mid-life falls prevention programs/models on an international scale. Programs identified that fell within the identification standards (including efforts at all levels, such as legislative, environmental, community, and individual) were considered for nomination.
Nomination

The aim of the nomination step was to form a broad picture of programs that seem promising and deserving of further study. Key informant contacts were identified and/or established through program documents such as annual reports and evaluations requested, so that further referral information could be obtained.

Only programs that satisfied collaboratively agreed upon criteria were investigated and ultimately evaluated for the review. The following Nomination Criteria was suggested for use during the nomination stage of the project:

1. Credibility of source: a rating of the authority of the source in the field.
2. Community reputation: a rating of the program’s standing among members of the field.
3. Frequency of referral: the number of times a specific program is nominated by different referral agents.
4. Country and region: the geographical location of the program.
5. Position and demonstrated experience: length and degree of experience of the program since its inception.
6. Stakeholder participation: whether stakeholders have roles in the program.

Selection

Documented information received from programs that have met the nomination criteria were further examined to determine if they met the selection criteria so as to help us to further develop a profile of what constitutes best practice. This set of criteria was
created by the combined research knowledge and expertise of the research team and contacts established within the mid-life falls prevention field and included:

1. Replicability and adaptability to Canada
2. Sufficient documented information
3. Innovative strategies
4. Open and cooperative participation in the case writing process.

**Phase 2: Data Gathering Methods**

Programs that have met the requirements of Phase 1 became candidates for more in-depth investigation. In Phase 2, we began by using a semi-structured questionnaire (primarily a telephone interview) that followed the BRIO Model (Background, Resources, Implementation, Outcome) in order to provide a consistent way of describing each case so that a comprehensive yet succinct understanding of the program’s structure and operation could be made explicit. The second half of Phase 2 was to understand how the program fit into the Life Space Case Analysis framework, using the Complex Systems Conceptual Scheme.

**The BRIO Model**

**Background:** According to the BRIO Model, exploring the background of a program is to uncover its history, and the environment and events that have shaped the program development and implementation (e.g., legal mandates in a community, special funding opportunities, community reactions to the program.) Background inquiries aim to understand why the mid-life falls prevention program takes a particular form, and how,
for example, relevant policies, legislation and community needs have influenced the objectives of the program. Sample questions that probed the background of the nominated programs include:

a) What was the mid-life falls injury issues at the intervention site prior to program implementation?

b) Who initiated the program?

c) What were the original goals and objectives of the program?

d) What events surrounded the development of the program?

e) What were the community reactions to the program at the time of program development?

f) What were the reactions of program personnel at the time of development?

g) How do associated professionals and sponsors perceive the program?

h) Who (if any) are the chosen community partners?

i) What is evidence for program sustainability? Are the stages of implementation (exploration, installation, initial and full implementation, innovation, and sustainability) discernible in the current integrated and compensatory practices of the program (Fixsen, Blase, Naaom, & Wallace 2007)?

All of the programs and strategies profiled were organized into the BRIO and Life Space case frameworks and classified according to the major areas of mid-life falls prevention.

**Resources**: The term resources calls for an investigation of the program design and resource allocation, particularly, how the program intends to achieve the articulated
objectives. Financial resources and the strategies adopted to promote injury prevention strategies are critical inputs to the program that should be clarified. Knowledge of alternative implementation and prevention strategies is useful to gauge the fit of the chosen approach. The following are examples of questions that examine resources:

a) What injury prevention strategies are employed in the program?

b) What financial resources are committed to the program?

c) What kinds of resources are developed for and allocated to the program?

**Implementation:** When discussing program implementation, we refer to the operationalization of a program, comparing the intended program design with how the program is actually practiced. The Fixsen (2010) model was employed to assess potential implementation drivers such as the explicitness of fidelity features and potential for staff training/coaching. Moreover, the Fixsen stages of implementation (exploration, installation, initial implementation, and full implementation) were used as descriptors in the nominee’s program history. An additional feature of this review derived from the Fixsen model was an examination of how and why a sustained or replicated mid-life falls prevention program does or does not adhere to the original plans for program governance, administration, management, implementation, and practice. Questions probing implementation issues include:

a) What checks on program process have been made?

b) What evidence exists as to the relation between what was intended in the program’s design and what exists today?

c) How and when are adjustments to the program made?
d) How is feedback structured and given to management and front line service providers?

Outcome: To understand a program’s outcome is to determine the impact of the program. This component asks how practitioners, participants, and observers judge the attainments of the program. Long- and short-term outcome measures of the program, including intended and unintended positive (e.g., improved awareness of safety standards in the workplace) and negative outcomes, are of interest. Examples of questions that explore the outcome of a program include:

a) How do practitioners, participants and observers judge the attainments of the program?
b) What are the short-term and long-term outcomes of the program?
c) What were any unanticipated positive or negative outcomes of the program?
d) How does the program measure success or effectiveness?
e) How (if at all) does the program disseminate program information?

Phase 3: Final Criteria for Determining a Best Practice

In this phase, actual “Best Practices” were identified. The descriptive analysis of each nominated program employed a set of collaboratively generated best practice criteria derived from the previous reviews and from the team’s professional experience, partners associated with the research initiative, published literature, and from successful practices and programs:
(a) Avowed Support of Injury Prevention

How does the program prove its commitment to mid-life falls prevention? Is the program committed to injury prevention at the primary and secondary levels (i.e., at the pre-event and event stages)?

(b) Multidisciplinary Framework and Multilevel Approaches

Does the program use a multidisciplinary framework or approach?

(c) Environmental and Behavioural Strategies

Does the program employ a combination of environmental and behavioural strategies? Does it create new injury risks?

(d) Developmental Approaches, Flexibility and Adaptability

Does the program incorporate a developmental perspective?

(e) Implementation and Outcome Evaluation

Is the program’s methodology grounded in credible and appropriate sources?

Can the program be defined in terms of its implementation?

(f) Broad-Based Community Support and Capacity Building

Does the program have active community support?

(g) Cost-Effectiveness Analyses

Does the program employ a cost analysis?

Can it adopt one with a long-term perspective?

(h) Sustainability

How has attention to the long-term viability of the program been addressed?

How adequate are efforts to continue, maintain benefits and build capacity?
Contribution to Prevention Science

How does the program’s evaluation research contribute to the refinement and elaboration of the conceptualization of injury prevention?

The review and casing of best practices in the prevention of mid-life falls helped to establish useful connections between a complex systems perspective of prevention and to create a unique set of cases for advancing falls prevention in everyday life.

Report Overview

The outcome of our review is presented in the following three sections.

Section One presents what is known about the incidence of falls in mid-life. As is the case in other times in the life span, the review is made complex by multiple causes and predisposing risk factors identified in mid-life. The review is further complicated by the reality that the crucial combination of incidence of falling and susceptibility to injury in older adults is often absent in mid-life and as a consequence many falls go unreported. The present literature review seeks to provide a focused perspective on the risks and protective factors coupled with an examination of effective prevention practices dealing with injuries associated with falls across the life span that are pertinent to falls in adults aged 25–60. The purpose of this review is to fill the knowledge gap pertaining to the circumstances in which falls in adults occur and how these falls are different, similar to, or a predictor of falls in older adults and to allow us the ability to more accurately and effectively target preventative services, promote earlier preventative behaviors, and thereby produce a significant reduction in the social, economic, and health burden to those who without such services would otherwise be left at greater risk.
Section Two contains six case studies of exemplary fall prevention efforts. These cases were selected on the basis of the previously reviewed criteria from 165 nominated programs. The organization of the case studies was guided by the major systematic review conclusion of the National Institute for Clinical Excellence (2013) that activity (walking, strengthening and exercise) without balance training is largely ineffective. Consequently, the cased programs are ordered by the role played by balance training, community systems delivery, and specific incidence reducing measures.

Section Two begins with Case 1, The Fallfritt (Fall Free) Initiative, a safety management and falls prevention campaign, implemented in Södertälje, Sweden to control and reduce fall-related injuries in 55 to 65 year old woman. The campaign was developed to reduce falls through a collaborative effort including researchers and health care practitioners. This initiative has been associated with a considerable reduction in women’s hip fractures in the council of Södertälje, and in the near surrounding areas. The project demonstrates the advantages of a broad, community-based approach to falls prevention.

Case 2, Balance Training Program, was designed for women over 60 years of age and targeted menopausal women and the consequential loss of balance due to estrogen reduction that commonly occurs during the menopause period. The program aimed to improve balance and mobility, sensory system function and reaction times, as well as strength and flexibility, to delay the age-related decline. Many physiotherapists have incorporated the Specific Balance Strategy Training as part of their curriculum in educating clients about the risk of slips, trips, and falls, and how to prevent them through improving balance.
Case 3, Walk with Ease, is a community-based physical activity and self-management education program for anyone older than 18 with joint pain and arthritis. Individuals can use the Walk with Ease workbook on their own or in groups led by trained leaders. Both the individual and group formats are set up as a structured six-week program. While walking is the central activity, Walk with Ease is a multi-component program that also includes health education, stretching and strengthening exercises, as well as motivational strategies.

Awareness Through Movement (ATM), Case 4, is an educational system that assists mid-life adults with chronic disabling ambulatory conditions such as multiple sclerosis in the development of a functional bodily awareness of the self in the environment. ATM works with people to expand their repertoire of movements, to enhance awareness, and to improve balance and balance confidence. The content of the classes described in this case is tailored to the neuromusculoskeletal status of each participant, with complexity ranging from participant to participant, and guidance and rest provided when needed. The change observed in the evaluations of this approach suggests that further study of this type of intervention could be beneficial to mid-life and older adults, as well as people with Multiple Sclerosis and other disabling diseases.

The goal of Case 5, DIY Falls: Take Time Before You Climb program is to reduce the instance of ladder falls in mid-life handymen/women. The primary objectives of the program are to educate the public about the risk factors associated with falls from heights, and to affect a commitment to behaviour change, toward safe practice with respect to ladder use. The implementation of the program is achieved using distinctive branding, case studies to personalize the campaign, staff training at local do-it-yourself
outlets and stores, comprehensive media coverage, in-store ladder safety promotions, and displays at home shows. Outcome evaluations of the program show commitment to behavioural change in relation to ladder use. The program successfully engaged the local community and ultimately increased their awareness of ladder safety and its importance.

Finally, Case 6 is Tai Chi for Health. Tai chi is a way of reducing stress, improving balance and flexibility, increasing relaxation and improving overall mental well-being. Added benefits associated with Tai Chi include the relief of pain and stiffness, especially from arthritis, and the reduction of the number of falls among mid-life and older adults. This 12-movement program is based on the Sun style of Tai Chi, a style known for its smooth, flowing movements, which exclude more physically vigorous movements. Evaluation of this form of Tai Chi training has been shown to improve balance, flexibility and reduce the number of falls. Tai Chi has been listed by Centre for Disease Control as one of the top three programs for fall prevention for older adults.

Section Three provides a Directory of the Advisory Community of Practice associated with this research project. The creation of the advisory community of practice was a major step in both the implementation and knowledge mobilization activities associated with this undertaking. A lesson learned in our efforts to implement programs is recognizing that transferring knowledge about these evidence-based programs requires their adaptation to local capacities and contextual challenges. As mentioned, establishing this group of program implementers, research knowledge generators, policy makers and other stakeholders was valuable in building a sense of trust among community members, which allowed for the exchange of knowledge and contributed to developing a culture open to new practices.
Section One:

REVIEW OF THE DISTRIBUTION, DETERMINANTS, AND RISKS FOR FALLS ACROSS THE LIFE SPAN

As stated in the Introduction, falls are a significant public health problem that needs to be addressed by community-based interventions. Until recently, research in the field of fall prevention has focused on our aging population, and little attention has been turned to young and mid-life adults. This is currently an understudied and neglected area in public health. As an emerging area of interest, identifying and implementing best practice interventions with the aim of preventing falls in adults in everyday activities is of utmost importance.

The high burden of morbidity and evidence of preventability associated with falls, combined with the existence of successful interventions, makes decreasing falls in this age group a realistic goal. Moreover, as it has been shown that falls in mid-life adults are likely to predispose individuals to a higher risk in years to come, characterizing best practices in this area is not only of value presently, but an investment in reducing future falls as well (Talbot et al., 2005). Fall prevention strategies should actively engage working-age adults and should be seen as a necessary complement to existing programs focusing on older adults. By expanding this focus beyond senior and child demographics to include the mid-life populous, falls researchers and practitioners not only can assist mid-life adults in becoming more aware of and concerned about the risks of falls (including the cumulative effect of falls on functioning in later life), but also they can
begin implementing prevention strategies that serve to lessen the numbers of falls-related injuries and to improve falls outcomes in later life.

To date, very little research has been conducted on falls in mid-life. Research that has thus far been conducted on the long term impacts of falls in mid-life populations has sufficiently demonstrated that there is a need to understand the risks and costs associated with the occurrence of falls in mid-life. Despite this however, falls prevention programming for mid-life adults is scarce. To date, there are very few programs that have been designed and/or implemented specifically for the mid-life populous. Given the fact that falls are among the leading causes of injury for mid-life adults, in addition to the existing findings that demonstrate the need to understand risks and costs associated with the occurrence of falls in mid-life (World Health Organization, 2012; Centers for Disease Control and Prevention, 2012), clearly there is an urgent need to re-evaluate and extend our focus to include this very large and under-represented group.

This review aims to elucidate potential exemplary programs in the prevention of falls in young and mid-life adults in everyday activities. It therefore does not include programs aimed at fall prevention in occupational or hospital-based settings, professional sports, or programs targeting older adults. Community based injury prevention work has become a widely accepted strategy in health promotion (Nilsen, 2004), and the under-scrutinized area of fall prevention in young and mid-life adults is ripe for improvement.

Slips, trips, and falls are a serious public health concern. Each year they result in a variety of injuries, including fractures, sprains, strains, cuts, abrasions, and in some cases, even death. In Canada, fall-related injuries account for 31% of the total estimated cost of injuries, or 6.2 billion dollars, annually (SMARTRISK, 2009). Thus, falls are a major
contributor to unintentional injury and lead to significant economic loss. In addition to
the economic burden of slips, trips, and falls, this type of injury also leads to a number of
unfortunate social costs in the form of pain and suffering. For example, those who
experience slips, trips, and falls may no longer be able to participate in sports, or drive
long distances. Sufferers may also continue to experience problems with their balance for
a prolonged period of time after the incident, leading to an increased feeling of
dependency. These impediments affect both one’s ability to work and one’s private life.
In such, the social costs related to slips, trips, and falls are often associated with
indicators of a poor quality of life. Costs may also extend beyond the individual and
include the emotional and mental health effects (e.g., pain, grief, suffering, and quality of
life) on co-workers and family members.

Though falls are more frequent among senior populations (65+), people of any age
can experience a slip, trip, or a fall and the negative social, economic, and health sequelae
that so often accompany these events. Given the extent to which a slip, trip, or fall can
result in lasting, serious consequences, a good investment, both for individuals and
society as a whole, would be to develop and implement a series of provisions and/or
programs aimed at fostering risk prevention and a heightened awareness among all
stakeholders. Despite the potential benefits that could be derived from risk prevention
strategies that span the life-course, such programs are very rare. While programs that
seek to address risk management and prevention issues currently do exist, these programs
are largely created for and/or marketed toward two specific age demographics: senior and
youth populations (i.e., those under the age of 14).
Defining Slips, Trips, and Falls

By understanding the definition of, and acknowledging risk factors related to slips, trips, and falls, we can predict not only the likelihood of a fall occurring, but also set in place a number of preventative strategies that can help to lessen the incident of slips, trips, and falls and the economic, social, and human costs associated with them.

For the present research, slip, trip and falls in everyday life refers to injuries sustained or occurring in environments that are non-occupational, non-healthcare and non-sport related. These environments can include the home, as a visitor or patron (e.g., in retail environments, healthcare facilities, marinas/docks), during commutes (e.g., on streets, in transit), in indoor and outdoor home and non-home environments for people living with illnesses and disabilities and injuries sustained as a result of environmental design or mal-design (e.g., stairs, hallways, railings).

Fall: A fall is one of the external causes of unintentional injury. It is coded as E880-E888 in International Classification of Disease-9 (ICD-9), and as W00-W19 in ICD-10. These codes include a wide range of falls including falls on the same level, upper level, and other unspecified fall. A fall is often defined as “inadvertently coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other objects.”

Slip: The act of slipping occurs when a person’s heel slides suddenly or involuntarily on a walking surface and causes a loss of balance. Slips typically occur when there is too little friction or traction between a person’s foot (or shoe) and the walking surface. A slip
most often results in a person falling backward. Conditions that increase ones risk for slipping include snow and ice in parking lots and entranceways, as well as debris on a floor such as paper (Marsh Canada Limited, 2007).

**Trip**: Trips occur when the body’s center of gravity is in motion, and the toe collides with a near-ground obstacle, which causes the foot movement to abruptly stop. In this case, the person usually falls forwards. Conditions that increase ones risk for a trip include uneven sidewalks, or floors, holes in pavement, chipped or broken stairs, improper lighting, extension cords, loose or ragged carpet, and lack of signage or warning of a “step up” or “step down” (Marsh Canada Limited, 2007)

Experiencing a slip, trip, or a fall can have a devastating physical and psychological effect on a person, resulting in disability, chronic pain, loss of independence, reduced quality of life, and even death. In addition to serious injury, slips, trips, and falls can result in a number of social, economic, and human costs. However, it is important to remember that while most falls related injuries do result in a number of negative health costs, most are not only preventable but also, predictable.

**Social Determinants of Slips, Trips and Falls in Everyday Life**

The World Health Organization (WHO) defines the social determinants of health as the conditions in which people are born, grow, live, work and age, and includes their health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. The social determinants of health are mostly
responsible for health inequities—the unfair and avoidable differences in health status seen within and among countries (http://www.who.int/social_determinants/en/).

According to the Public Health Agency of Canada, there are 12 key determinants of health, including (http://www.phac-aspc.gc.ca/ph-sp/determinants/#determinants):

1. Income and Social Status
2. Social Support Networks
3. Education and Literacy
4. Employment/Working Conditions
5. Social Environments
6. Physical Environments
7. Personal Health Practices and Coping Skills
8. Healthy Child Development
9. Biology and Genetic Endowment
10. Health Services
11. Gender
12. Culture

The following overview describes some links between the social determinants of health and injury. References are made where possible to falls in mid-life (for adults aged 20–64) and in everyday life (excluding work, healthcare and sport injury and interventions).

**Income and Social Status.** Health status improves at each step up the income and social hierarchy. High income determines living conditions such as safe housing and ability to buy sufficient good food. The healthiest populations are those in societies that are prosperous and have an equitable distribution of wealth. According to the Canadian Institute for Health Information (CIHI) (2010), the burden of injury is not evenly distributed among all population groups, particularly between those at different socio-economic levels. According to CIHI (2010), for young adults (age 25 to 44), older adults (age 45 to 64) and older adults (age 65+), the rates of hospitalizations for falls presented a socio-economic gradient, with the highest rates in the least affluent areas.
Social Environments. This determinant is relevant to the broader discussion of municipal public safety. Civic vitality refers to the strength of social networks within a community, region, province or country. It is reflected in the institutions, organizations and informal giving practices that people create to share resources and build attachments with others. The array of values and norms of a society influence in varying ways the health and well-being of individuals and populations. In addition, social stability, recognition of diversity, safety, good working relationships, and cohesive communities provide a supportive society that reduces or avoids many potential injuries and risks to good health.

Personal Health Practices and Coping Skills refers to those actions by which individuals can prevent diseases and promote self-care, cope with challenges, and develop self-reliance, solve problems and make choices that enhance health. Definitions of lifestyle include not only individual choices, but also the influence of social, economic, and environmental factors on the decisions people make about their health. There is a growing recognition that personal life “choices” are greatly influenced by the socioeconomic environments in which people live, learn, work and play. These influences impact lifestyle choice through at least five areas: personal life skills, stress, culture, social relationships and belonging, and a sense of control. This determinant is critical as it relates to injuries in special populations. Multiple risk-taking behaviors, including such hazardous combinations as alcohol, drug use and driving, and alcohol, drug use and unsafe sex, remain particularly high among young people, especially young men.

Biology and Genetic Endowment. This determinant of health is particularly important in the 20–64 age range as individuals are aging and will eventually populate the elderly age group in Canadian and Ontario society. Improved outreach and intervention at an early age translates into healthier and better-prepared aging and aged populations. The basic biology and organic make-up of the human body are fundamental determinants of health. Genetic endowment provides an inherited
predisposition to a wide range of individual responses that affect health status. Although socio-economic and environmental factors are important determinants of overall health, in some circumstances genetic endowment appears to predispose certain individuals to particular diseases or health problems. Aging is not synonymous with poor health. Active living and the provision of opportunities for lifelong learning may be particularly important for maintaining health and cognitive capacity in old age.

Prevalence/Incidence

Falls are the leading cause of overall injury costs in Canada and account for $6.2 billion or 31% of total costs of all injuries in a year (Safer Healthcare Now, 2012). In 2009, 41% of 1.7 million people injured stated they were injured in a fall. In 2008–2009, 53,545 Canadian older adults were admitted to hospital because of a fall, which accounted for 85% of major injuries and 40% of which were hip fractures (Safer Healthcare Now, 2012). In addition, in 2007, 15,064 people died of injury-related causes (6% of all fatalities). Of these deaths, 24% were suicides, 21% were transport-related deaths, and 18% were the result of a fall (Safer Healthcare Now, 2012).

Province of Ontario – Regional Breakdown of Epidemiological Data

The Ontario Injury Prevention Resource Centre (and supported by Public Health Canada) has broken down provincial injury statistics by regions in the province. Each region is composed of a cluster of municipalities in six areas of the province: Central East Region (CE)\(^1\), Central West\(^2\), Eastern Region\(^3\), Northern\(^4\), Southwest\(^5\) and Toronto\(^6\).

---
\(^1\) Central East Region (CE): Peel Public Health, York Region Public Health, Durham Region Public Health, Peterborough County-City Health Unit, Simcoe Muskoka District Health Unit, Haliburton, Kawartha, Pine Ridge District Health Unit
\(^2\) Central West: Haldimand-Norfolk Health Unit, Brant County Health Unit, Niagara Region Public Health, Wellington-Dufferin-Guelph Public Health, Hamilton Public Health, Waterloo Public Health, Halton Region Public Health
Table 1: ER Visits and Hospital Visits for Falls, By Region, 2007-2009, Ontario

<table>
<thead>
<tr>
<th></th>
<th>Central East</th>
<th>Central West</th>
<th>Northern (2)</th>
<th>South West (2)</th>
<th>Eastern</th>
<th>Toronto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Room Visits</td>
<td>188,315</td>
<td>149,693</td>
<td>67,852</td>
<td>111,699</td>
<td>109,997</td>
<td>127,770</td>
</tr>
<tr>
<td>Hospital Visits</td>
<td>15,811</td>
<td>15,444</td>
<td>6,524</td>
<td>10,291</td>
<td>10,286</td>
<td>13,779</td>
</tr>
<tr>
<td>Deaths</td>
<td>1,036</td>
<td>1,028</td>
<td>337 (3)</td>
<td>645 (3)</td>
<td>699</td>
<td>1,045 (2)</td>
</tr>
</tbody>
</table>

Fall related injuries were the most common cause of emergency room visits and hospital admissions in each of these six regions between 2007 and 2009.

Canadian Falls Data – Age Breakdown

In 2011, Statistics Canada explored the age breakdown of injuries sustained in Canada by three groups: adolescents aged 12 to 19, working-age adults aged 20 to 64, and older adults aged 65 or older. The rationale: each of these age groups has different injury experiences (Table 2) (Billette & Janz, 2011). In the section below, we briefly examine what is known regarding falls injury, prevention, and outcomes for each of the three age groups.

---

3 Eastern Region: Renfrew County and District Health Unit, Hastings and Prince Edward Counties Health Unit, Kingston, Frontenac and Lennox & Addington Public Health, Leeds, Grenville and Lanark District Health Unit, Eastern Ontario Health Unit, Ottawa Public

4 Northern: Northwestern Health Unit, Thunder Bay District Health Unit, Porcupine Health Unit, Sudbury District Health Unit, Timiskaming Health Unit, Algoma Public Health, North Bay Parry Sound District Health Unit Safer Healthcare Now (2009). Improvements to Reduce Falls and Injuries from Falls Falls Facilitated Learning Series Recap Report.

5 South West: Windsor—Essex County Health Unit, Chatham—Kent Public Health Unit, Elgin St. Thomas Public Health, Lambton Community Health, Middlesex—London Health Unit, Oxford County Public Health, Huron County Health Unit, Grey Bruce Health Unit, Perth District Health Unit

6 Toronto: Toronto Public Health
Table 2: Number and percentage who sustained at least one activity–limiting injury during the past 12 months, population aged 12 and over, Canada, 2009–2010

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number ’000</td>
<td>Rate (%)</td>
<td>Number ’000</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4,272</td>
<td>14.9</td>
<td>2,414</td>
</tr>
<tr>
<td>Age 12-19</td>
<td>890</td>
<td>25.5</td>
<td>522</td>
</tr>
<tr>
<td>Age 20-64</td>
<td>2,961</td>
<td>13.8</td>
<td>1,717</td>
</tr>
<tr>
<td>Age 65+</td>
<td>421</td>
<td>8.9</td>
<td>175</td>
</tr>
<tr>
<td>Ontario</td>
<td>1,600</td>
<td>14.3</td>
<td>904</td>
</tr>
</tbody>
</table>

(Received & Janz, 2011)

**Older Adult Falls**

Figure 1 shows the incidence rate of fall injuries for men and women by 5-year age group. The injury rate increases with age from 35 per 1000 population for people age 65-69 to 76 per 1000 population for people age 80 and over. For ages 65 and older, the rate of fall injuries (serious enough to limit normal activities) was 47.7 per 1000 population (Public Health Agency of Canada, 2009). Rates among women exceed those of men for all age groups. These gender differences are statistically significant except for ages 75-79. The authors suggest that these gender differences may be related to women’s lower income and greater social isolation (Yoshida, 2007). In addition to the data presented on Figure 1, it has been estimated that one in three older adults are likely to fall at least once per year (World Health Organization, 2007). Further, it has been estimated that 5% to 25% of older adults who fall will sustain a serious injury such as a fracture or a sprain.
(Alexander, Rivara, & Wolf, 1992). Of these individuals, it is estimated that 20% will die within a year (Zuckerman, 1996).

The occurrence of falls increasing in frequency with advancing age and growing frailty as well as the severity of injuries sustained by older adults who experience falls emphasizes the senior age demographic as a key area of concern (Health Canada, 2002).

In addition to the physical health costs associated with falls-related injuries among older adults, specifically among older women who are statistically more susceptible to falls injuries than men, falls injuries are also associated with substantial economic costs. For example, according to the National Center for Injury Prevention and Control, in 2000, direct medical costs for fatal and nonfatal fall injuries totaled $19 billion. The total direct medical costs of fall injuries for people 65 and older, adjusted for inflation is now estimated at $30 billion. In Canada, fall-related injuries are thought to account for 31% of the total estimated cost of injuries, or $6.2 billion, annually (SMARTRISK, 2009). Thus, falls among older adults, with or without injury, carry a heavy economic burden. Given

![Diagram](source: Division of Aging and Older adults and P.H.A.O. Canada, 2009)
the worldwide, the number of persons over 60 years is growing faster than any other age group (National Council on Ageing, 2005), falls prevention strategies applicable to this age demographic has become imperative.

Because of the high morbidity and mortality rates of older adults exposed to slips, trips, and falls, in addition to the increasing rate at which the population is aging, a large number of effective tools for falls prevention have been developed and are currently employed within community settings.

Many of these initiatives have demonstrated positive results. For example, the return on investment of injury prevention efforts such as those listed above have been widely examined, and experts suggest that a 20% reduction in falls among older adults aged 55 years and over could result in 1,000 fewer older adult permanent disabilities, and 4000 fewer hospital stays. The cumulative results of avoiding these direct health care costs are estimated to amount to almost $121 million annually (SMARTRISK, 2006).

**Falls in Childhood and Adolescence**

Although the majority of fall-related deaths are among adults (specifically older adults), falls rank as the 12th leading cause of death among 5–9 year olds and 15–19 year olds (World Health Organization, 2008). For example, each year in Canada, about 26 children and youth die, and over 20,000 more are hospitalized due to fall-related injuries (Table 3). Further, among children below the age of 15 years, non-fatal falls were considered the thirteenth leading cause of disability-adjusted life years (DALYs) lost (World Health Organization, 2004). Consequently, in Canada, falls are considered the leading cause of injury-related hospitalization in children and youth (Public Health
Injury rates are thought to be highest among toddlers and older children, with falls being the most frequent cause of emergency department visits and hospitalizations of children between 0-14 years old (Macpherson, Schull, Manuel, Cernat, Redelmeier, & Laupacis, 2005). These statistics parallel those found within the United States. For example, according to the six year-long Childhood Injury Report, falls were listed as the leading cause of nonfatal injury for all age groups less than 15 (Centers for Disease Control and Prevention).

Table 3

<table>
<thead>
<tr>
<th>External cause of injury, ICD-9</th>
<th>Deaths</th>
<th>%</th>
<th>Hospitalizations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall on or from stairs or steps (E880)</td>
<td>1</td>
<td>5.2</td>
<td>1,633</td>
<td>8.1</td>
</tr>
<tr>
<td>Fall on or from ladders or scaffolding (E881)</td>
<td>0</td>
<td>1.3</td>
<td>128</td>
<td>0.6</td>
</tr>
<tr>
<td>Fall from or out of building or other structure (E882)</td>
<td>7</td>
<td>27.3</td>
<td>634</td>
<td>3.1</td>
</tr>
<tr>
<td>Fall into hole or other opening in surface (E883)</td>
<td>1</td>
<td>3.9</td>
<td>206</td>
<td>1.0</td>
</tr>
<tr>
<td>Other fall from one level to another (E884)</td>
<td>8</td>
<td>32.5</td>
<td>7,718</td>
<td>38.0</td>
</tr>
<tr>
<td>Fall from playground equipment (E884.0)</td>
<td>-</td>
<td>-</td>
<td>2,850</td>
<td>14.1</td>
</tr>
<tr>
<td>Fall from chair or bed (E884.2)</td>
<td>1</td>
<td>3.9</td>
<td>1,446</td>
<td>7.1</td>
</tr>
<tr>
<td>Other (E884.1, 9)</td>
<td>7</td>
<td>28.6</td>
<td>3,423</td>
<td>16.9</td>
</tr>
<tr>
<td>Fall on same level from slipping, tripping or tumbling, collision, pushing or shoving (E885, E886)</td>
<td>1</td>
<td>5.2</td>
<td>6,087</td>
<td>30.0</td>
</tr>
<tr>
<td>Fall in sports (E886.0)</td>
<td>1</td>
<td>5.2</td>
<td>1,460</td>
<td>7.2</td>
</tr>
<tr>
<td>Other and unspecified (E885, E886.9)</td>
<td>-</td>
<td>-</td>
<td>4,627</td>
<td>22.8</td>
</tr>
<tr>
<td>Fracture, cause unspecified (E887)</td>
<td>2</td>
<td>7.8</td>
<td>384</td>
<td>1.9</td>
</tr>
<tr>
<td>Other and unspecified fall (E888)</td>
<td>4</td>
<td>16.9</td>
<td>3,496</td>
<td>17.2</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100.0</td>
<td>20,285</td>
<td>100.0</td>
</tr>
</tbody>
</table>

As a result of falls being one of the leading causes of hospitalization (37%) for children and youth, the Canadian Paediatric Society has published a number of evidence-based position statements aimed at reducing incidents and risk factors. The subsequent
development of evidenced based playground standards, enforcing helmet use for skiing and snowboarding, and restricting children and youth from operating ATVs and snowmobiles have all led to a reduction in the incidence of slips, trips, and falls in this age group.

Evidence from Canada suggests the implementation of effective prevention strategies with a subsequent 20% reduction in the incidence of falls among children 0 – 14 years of age, could amount to fewer injuries and cost savings of $62 million annually (SMARTRISK, 2006).

**Falls in Mid-life**

According to Statistics Canada, in 2010 35% of mid-life adults were injured in falls related injuries. According to the Ontario Trauma Registry 2011 Report: Major Injury in Ontario, 2009–2010 Data (Canadian Institute for Health Information, 2011), overall, the most commonly specified types of falls were falls from stairs (22%, n = 353; Appendix H, Table 16) and falls on the same level from slipping, tripping and stumbling (21%, n = 337; Appendix H, Table 16). Cases aged 35 to 64 accounted for 30% (n = 483) of all unintentional falls. The most commonly specified cause of falls in this age group was falls on or from stairs or steps (27%, n = 128). And finally, only 6% (n = 100) of all cases due to unintentional falls occurred among those between age 20 and 34.

The most common cause of major injury hospitalization due to falls in this age group was falls from, out of or through buildings or other structures (33%, n = 33). According to the Ontario Trauma Registry 2011 Report: Major Injury in Ontario, 2009–2010 Data, the mean age of all injury cases was 48 (median = 49): Those age 20 to 34
accounted for 19% (n = 791) of all cases and 19% (n = 11,496) of participating hospital
days; those aged 35 to 64 accounted for 37% (n = 1,576) of all cases and 38% (n =
23,139) of participating hospital days. Therefore, those aged 20 to 64 accounted for over
half, or 56%, of all cases (CIHI, 2011). Additionally, in a recent report released by
SMARTRISK today, The Economic Burden of Injury in Canada, injury from falls were
listed among the leading cause of death for Canadians aged one to 44.

In addition to these findings, it was discovered that the majority of injury
occurrences in this age group happened within the confines of ordinary every day events
(Table 4). Within the mid-life range, injuries from slips, trips, and falls are mainly due to
factors that exist within the context of everyday life.

Table 4: Causes of Injury, Cases Age 35 to 64, Ontario, 2009–2010

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Total (All Ages)</th>
<th>Age 20 to 64 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number ‘000</td>
<td>Rate (%)</td>
</tr>
<tr>
<td>Sports, physical exercise</td>
<td>1,470</td>
<td>34.9</td>
</tr>
<tr>
<td>Household chores</td>
<td>627</td>
<td>14.9</td>
</tr>
<tr>
<td>Working at a job or business</td>
<td>578</td>
<td>13.7</td>
</tr>
<tr>
<td>Walking</td>
<td>490</td>
<td>11.6</td>
</tr>
<tr>
<td>Leisure or hobby</td>
<td>320</td>
<td>7.6</td>
</tr>
<tr>
<td>Driver or passenger in on-road or off-road motor vehicle</td>
<td>207</td>
<td>4.9</td>
</tr>
<tr>
<td>Going up, down stairs</td>
<td>166</td>
<td>3.9</td>
</tr>
<tr>
<td>Sleeping, eating, personal care</td>
<td>123</td>
<td>2.9</td>
</tr>
<tr>
<td>Other (Billette &amp; Janz, 2011)</td>
<td>231</td>
<td>5.5</td>
</tr>
</tbody>
</table>
Given the occurrence of falls in mid-life populations and the social and economic costs associated with these injuries, one could reasonably predict that there would be many programs aimed at the prevention and or assessment of risk for falls in mid-life populations.

While some agencies have already implemented preliminary forms of falls prevention measures for mid-life populations, a systematic, evidence-informed organizational approach to falls prevention in this age demographic is nonetheless lacking. Moreover, the research that does exist is limited in its ability to generalize to sub-populations within the mid-life range—largely restricted to the examination of falls-related injuries in the workplace and in competitive sports. This limited focus is problematic for a number of reasons.

First, women fall more often than men, with estimates as high as twice the rate of men (Souza, 2009). However, men occupy workplace positions where there is the highest risk of injury (including falls). These positions include mining, agriculture, forestry, fishing, and construction. Each of these industries employs more men than women. For example, in 2009, only 30.1% of workers in manufacturing were women, only 19.5% of those in primary industries were women, and just 6.4% of those in transportation, trades, and construction work were women (Ferrao, 2010). Further, men are statistically more likely to be engaged in competitive sports than women. To illustrate, a Statistics Canada’s study of Sport Participation (2005) indicated that 52% of females aged 15 to 18 participated in sport, compared with 66% of males in the same age group. The gap became even more apparent in the lower mid-life (19–24) age range, where 52% of males participated in sport compared to 34% of females. Given that our focus for falls
prevention in mid-life rests mainly in two domains that are under-occupied/engaged in by women, our policies regarding slips, trips, and falls prevention in mid-life tend to be gender biased and thus under-informative for a vast majority of our population; specifically for a subset of our population who are statistically more inclined to falls injuries.

Second, those in the mid-life age range comprise a group whose fall injuries, though they are less likely to be fatal, have a considerable cost to the social and economic climate of the wider community. This is so because the mid-life period is one wherein most people (72%) are engaged in meaningful employment (Organization for Economic Co-operation and Development, 2012). Given that the employment rate of those 15–24 years of age ranges around 54.5% and the employment rate of those 65+ is around 12%, it is clear that the largest economic contributors to Canada’s economy are those in the mid-life age range (20–64) (Statistics Canada, 2012). Thus, though injuries in this age range may not be as severe as those experienced by those in the 65+ demographic or in youth and adolescence, the economic impact is much greater.

The failure to extend mid-life falls research beyond the workplace and competitive sport is reflective of the limited depth to which this issue has been explored. At this time, it is clear that in comparison to research conducted for those within youth and senior populations, very little has been conducted for those belonging to the mid-life population. Work emerging from the Life Span Adaptations Projects at the University of Toronto in collaboration with the Ontario Neurotrauma Foundation (ONF) has highlighted the need to include mid-life adults in our research and intervention initiatives for falls prevention. Just as the research and literature reviews in the child and senior demographics present
epidemiological data that justifies the need and responsiveness for interventions, so too has the work emerging from the Lifespan Adaptations Projects at the University of Toronto highlighted the need and responsiveness for falls interventions in mid-life.

<table>
<thead>
<tr>
<th>Table 5: Summary of Behavioural Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sedentary Behavior</strong></td>
</tr>
<tr>
<td>Sedentary behavior causes muscle atrophy and declines muscle strength. Those who are inactive fall more often than those who are moderately active or very active. Fear of falling triggers inactive behaviors. Fear of falling occurs in 30% of people age 65 and older, and is significantly associated with changes in balance and mobility, muscle weakness, and an increase in fall risk.</td>
</tr>
<tr>
<td><strong>Medication Intake</strong></td>
</tr>
<tr>
<td>Use of four or more medications is associated with fear of falling and a 9-fold increased risk of cognitive impairment,</td>
</tr>
<tr>
<td><strong>Alcohol Misuse</strong></td>
</tr>
<tr>
<td>Alcohol misuse affects biological decline in the part of brain that controls posture and balance. Ethanol intake of more than 1000g a month, or intake of 14 or more drinks per week increases the risk of injurious falls that can lead to hospitalization or death.</td>
</tr>
<tr>
<td><strong>Inappropriate Shoes</strong></td>
</tr>
<tr>
<td>Athletic shoes may be associated with fall risk because the relatively thick soft midsoles interfere with positional sense. High-heeled shoes may impair older women’s balance and increase their risk of falls. In one study, going barefoot or wearing only socks was associated with an increased risk of falling.</td>
</tr>
</tbody>
</table>

Although epidemiological data, statistics, and information regarding risk factors exist, within the current literature information detailing structured program interventions is lacking. Interventions for falls within the mid-life population tend to be neither formally evaluated nor readily available, particularly compared with the diversity of programs that have been devised and evaluated for older adults and children. The next section expands upon these issues and provides a rational for mid-life interventions. We will also reveal research findings from those already involved in such mid-life fall initiatives and introduce some of the limitations that are currently hindering progress in mid-life falls research.
Slips, trips, and falls occur as a result of complex interactions among demographic, physical and behavioral risk factors. Throughout the past two decades, risk factors have been identified and categorized as intrinsic or extrinsic factors. Intrinsic factors include demographic and biological factors, while extrinsic factors encompass environmental and behavioral factors (Yoshida, 2007). Tables 5 and 6 below illustrate the demographic, biological, and physiological risk factors that increase fall risk.

Yoshida (2007)

<table>
<thead>
<tr>
<th>Table 6: Summary of Biological Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Fall-related mortality rates increase exponentially with age, with the greatest increase after age 85.</td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Women have an injury rate 40-60% higher than men of similar age.</td>
</tr>
<tr>
<td>Women are 2.2 times more likely to suffer fractures as a consequence of falls.</td>
</tr>
<tr>
<td>Medical Conditions</td>
</tr>
<tr>
<td>Diabetic women are 1.6 times more likely to fall and twice as likely to suffer fall-related injuries as women without diabetes.</td>
</tr>
<tr>
<td>Approximately 38-68% of Parkinson’s disease patients experience falls due to gait disturbances.</td>
</tr>
<tr>
<td>Depression is associated with a 2.2 fold increased risk of falling but the direction of causality is unknown.</td>
</tr>
<tr>
<td>Women with mixed incontinence are three times more likely to fall as women who do not have this condition.</td>
</tr>
<tr>
<td>Persons with Alzheimer's disease are twice as likely to fall as people of the same age without this disease.</td>
</tr>
<tr>
<td>Physical Conditions</td>
</tr>
<tr>
<td>Muscle weakness is associated with an almost five times greater risk of falling.</td>
</tr>
<tr>
<td>Visual impairment is associated with slowed reaction time, increased body sway, and a 2.3 times increased risk of multiple falls.</td>
</tr>
<tr>
<td>Cognitive impairment from dementia and delirium is associated with increased risks ranging from 2.0 to 4.7.</td>
</tr>
<tr>
<td>Foot problems, such as severe bunion, toe deformity, ulcer and deformed nails, are associated with a two-fold increased risk of falling</td>
</tr>
<tr>
<td>Low BMI and weight loss are associated with low bone mineral density and an increased risk of fall-related fractures.</td>
</tr>
</tbody>
</table>

Yoshida (2007)
In addition to these risk factors, it is also currently understood that risk to slips, trips, and falls exist in an everyday setting within the context of human choice and environments. For example, the Ontario Injury Prevention Resource Centre reports four key fall risk factors by age for younger and mid-life adults. They include: (1) Individual differences in risk-taking behavior; (2) Alcohol and drug use; (3) Unsafe work conditions; and (4) Environmental factors such as snow, ice, uneven sidewalks, and unsafe stairs.

Community and municipal risk factors are also an existing safety issue. Community level municipal safety refers to sidewalks and public spaces in urban and rural centres. Public works departments have identified a need for uneven sidewalk repair and reducing obstructions in public pathways and walkways to reduce mild to serious injuries for pedestrians. In fact, at the municipal level, sidewalk safety awareness campaign has been launched to remind residents of the importance of keeping sidewalks clear of obstructions. Public Works and Transportation Engineering departments have also instituted policies regarding sidewalk repairs to reduce injury rates of pedestrians, cyclists, runners and the disabled. Focusing on reducing injuries for the disabled is a particular focus and is supported by disabilities acts instituted in countries around the world.

Areas of Risk for Falling in Mid-life

Outdoor Activities:

Li et al. (2009) report that the environmental risk factors associated with outdoor falls in mid-life adults could be prevented through better design and maintenance of
sidewalks, curbs, walkways, streets and parks. Research examining the risk factors and aetiology of outdoor falls in mid-life is outlined below.

**Snow and ice**

Although falls caused by slick surfaces are a known hazard, the substantial risk they pose for serious injury is under-appreciated. Falls and slips on ice or snow are common mechanisms of injury during winter. Incidences of such injuries are higher in colder climates with heavy snowfalls or regions where frequent shifts in temperatures lead to melting of snow and refreezing of the melted snow to ice. Prevention programs in this area were unearthed and evaluated with the aim that if programs are made available, they might provide examples of specific incidence reducing features to accompany general falls prevention efforts.

Snow and ice covered surfaces result in a high prevalence of slip and fall injuries among the general public (Gard & Lundborg, 2000). In the Canadian context, where winter is a reality for many months of the year, injuries attributable to slipping and falling on icy surfaces are a significant source of injury. In evaluating the relative cause of falls across the lifespan, environmental reasons were reported more frequently as a cause of falling among young and mid-life adults (Talbot et al., 2005). Given the fact that ambulation is also a leading cause of falls in this age group, primarily when walking outdoors, this is an area where effective prevention practices can reduce the risk (Talbot et al., 2005). As noted by Li et al. (2009), in an era when active living is promoted by health agencies, a better understanding of how the outdoor environment influences the risk for falls is important and the subsequent reduction of these risks is urgently needed.
Gao & Abeysekera (2004) provide a basis for prevention by exploring the aetiology of slips and falls on icy and snowy surfaces. Through the systematic identification of primary and secondary risk factors their research highlights the potential for a multifaceted approach to prevention. Identified practices shown to reduce the incidence of falls on slippery surfaces include four categories: human factors, footwear, environmental factors and management. Therefore, the total risk for slip and fall injuries depends on the interaction between individual behaviours, the task being performed and the external environment (Gard & Berggard, 2006).

Improving winter footwear can be achieved by standardizing design aspects that have been shown to decrease slips, taking into account sole material, tread design, sole hardness as well as flexibility (Gronqvist et al., 2001). Furthermore, traction can be improved through the use of anti-slip devices (Gao et al., 2004). In a Swedish intervention study three different designs of anti-slip devices—heel device, foot-blade and whole-foot device—were tested, and the heel anti-slip device was shown as most effective in preventing falls (Gard & Berggard, 2006). More recently, an intervention study in New Zealand was successful in showing that wearing socks over shoes resulted in a reduction in the likelihood of falling in icy conditions (Parkin, Williams & Priest, 2009). In addition to the improvement of footwear, Gao, Oksa, Rintamaki and Holmer (2008) demonstrate, through the study of gait and balance when walking on an inclined icy surface, that a biomechanical mechanism can be employed to counteract slip risk. This research suggests that learned gait mechanisms may be applied in intervention training techniques to improve gait balance when walking on slippery surfaces.
Additionally, it has been recommended that the provision of walking aids, in addition to gait training, may be successful at reducing falls (Gao & Abeysekera, 2004).

Addressing the environmental and managerial (policy) aspects in the prevention of snow and ice falls in mid-life adults requires improving awareness of slip risk, including the development of road and sidewalk “slipperiness warnings” in high risk areas (Gao & Abeysekera, 2004). These areas should be identified through the development of a registration system for pedestrian slipping and falling incidents in order to determine and target these high risk areas. This will also allow for the targeted improvement of snow clearance and anti-slip materials (such as sand), resulting in a decreased risk of injury (Gao & Abeysekera, 2004).

**Indoor/Other Activities**

The home environment presents many opportunities to decrease falls in the everyday activities of young and mid-life adults, as it presents the most common location of such injuries (Routley & Valuri, 1993, Runyan, Casteel, Perkis et al., 2005). Raising awareness as to the contribution of alcohol in the severity of falls, minimizing the risk posed by pets and tripping, and increasing the safety associated with non-occupational ladder use all present intervention opportunities resulting in a safer home.

**Alcohol Use:** Kool, Ameratunga, Robinson, et al. (2008) characterized the role of alcohol in the occurrence and burden of fall related injury at home. Specifically, the role of alcohol in contributing to serious unintentional falls resulting in fatalities and hospitalizations among working-aged adults was studied and reported as a significant risk
factor for falls at home among 25–60-year-olds, leading to the conclusion that approximately 20% of unintentional falls at home in this population may be attributable to the consumption of two or more alcoholic drinks in the preceding 6 hours (Kool et al., 2008). Researchers suggest that the contribution of alcohol consumption to fall morbidity should be addressed in a prevention program aimed at screening for alcohol abuse and brief interventions for hazardous drinkers in the emergency department and primary care setting (Beich et al., 2002). In addition, efforts should be made to raise public awareness of the potential risks associated with alcohol use and injuries at home (Kool, Ameratunga & Jackson, 2009).

**Pets:** A recent report by the Center for Disease Control (CDC) reported that 86,629 fall injuries each year were attributable to tripping over pets, resulting in an annual injury rate of 29.7 per 100,000 population (CDC, 2009). In addition, Kurrle, Day & Cameron (2004) report that pets are a significant risk factor for falls, particularly at night. An intervention aimed at increasing the visibility of pets in the dark and therefore decreasing the incidence of tripping is a pet safety device known as a glow-in-the-dark harness.

**Steps & Stairs:** Safety strategies aimed at avoiding tripping, particularly on steps and stairs, have been shown to be successful in increasing foot clearance and reducing the risk of a falls (Lord, Ward, Williams, & Anstey, 1993). Recent research has shown that a visual illusion which induces a perceived increase in a step’s riser height results in increased safety while navigating stairs, as the illusion causes an accompanying increase
in toe elevation, and therefore a reduction in falls associated with tripping on stairs (Elliot, Vale, Whitaker & Buckley, 2009).

**Ladders:** Prevention and awareness programs aimed at reducing occupational ladder falls are widespread, however the field of non-occupational ladder injury presents another significant burden of injury with between 60% and 80% of ladder injuries requiring hospital treatment occurring in a non-occupational setting (Bjornstig & Johnsson, 1992). The incidence of non-occupational ladder injuries is increasing, in part due to a “do-it-yourself” attitude toward home renovation, but also due to a lack of training, awareness and regulations surrounding personal ladder use (Bedi & Goldbloom, 2008).

Bedi and Goldbloom (2008) report that the prevalence of non-occupational falls from ladders could be attributed to an average of 25 hospital admissions per 100 000 population, with mid-life men most likely to be affected. It has been suggested that the development of interactive educational prevention programs would be beneficial in decreasing the risk of falls and the accompanying financial burden on the health care system, as ladder injuries result in a median hospital stay of seven days (Bedi & Goldbloom, 2008; O’Sullivan, Wakai, O’Sullivan et al., 2004).

Interactive educational programs aimed at increasing ladder safety and awareness have been developed by leading ladder safety organizations and should be promoted as a simple, effective means to decrease morbidity associated with home ladder use. The American Ladder Institute as well as The Ladder Association in the UK have recently developed and released such programs for public use, and these programs should be
considered as community-based tools for improving home safety and preventing falls in mid-life adults.

**Medication:** Research has shown that people who used two or more prescription medications are approximately three times more likely to have a fall-related injury compared to those who take one or no medication (Ziere, Dieleman, Hofman, et al., 2005). The authors suggest that there is an opportunity for risk reduction interventions associated with poly-pharmacy, and we expect to find a best practice in this area as we expand our search.

**Living Alone:** A relationship has been shown between living alone status and experiencing a fall, with adults who live alone experiencing the most falls (Elliot, Painter & Hudson, 2009). Interventions in the form of home assessments, safety equipment and personal emergency response systems have been successful in reducing the falls of mid-life adults who live alone and present an opportunity to identify best practices for this particular demographic (Elliot, Painter & Hudson, 2009).

**Casual (Non – Organized) Recreational Sports**

Canadian adults spend a considerable portion of their leisure time engaging in informal sports and recreational activities. It follows that injury during these activities should be targeted for prevention through education and awareness-raising activities in addition to equipment and environmental modifications. Identifying the best prevention strategies for recreational sports injuries is important not only given the increased health
benefits of physical activity, but also in reducing the significant economic impact. In a systematic review of recreational injury prevention in children, Scanlan et al., (2004) suggest that the majority of sports and recreational related injuries can be prevented by public awareness training activities, equipment design guidelines, policy and education. It is clear that identifying prevention techniques applicable to active mid-life adults will capitalize on a neglected age group who could benefit from applied public health knowledge in this area.

Falls resulting from recreational hunting have been significantly reduced by educational interventions. Furthermore, informal ice and snow sports such as skiing, snowboarding and skating represent an important target area for best practice in fall prevention in young and mid-life adults. It is also expected that fall prevention practices associated with running, inline skating, hockey and horseback riding were added to the current review.

**Hunting:** A hunting tree stand is an elevated platform or seat that allows hunters the advantage of a greater field of view while decreasing their odds of being detected by prey (Urquhard, Hawkins, Howdieshell & Mansberger, 1991). Falls from tree stands are the most common cause of injury among hunters and are associated with significant morbidity as they often result in spinal cord injury and subsequent disability (Lawrence, Gibbs, & Kohn, 1996). It has been recommended that further efforts be given to hunter safety education to reduce the incidence of these injuries. Successful safety education programs targeting the use of approved safety devices and precautions have been identified and have been shown to eliminate spinal cord injuries from tree stand-related
falls (Gates, Helmkamp, Wilson, et al., 2002). While current guidelines and hunter education programs in Canada take a step toward minimizing these risks, identification of best practices in this area will further decrease the burden of hunting related falls.

**Skiing & Snowboarding:** Downhill skiing and snowboarding are popular winter pastimes in Canada. According to a recent report in Ontario (Ontario Injury Compass, 2006) falls accounted for 89% of hospitalizations among skiers and snowboarders in the 2002/2003 fiscal year. Furthermore, the report indicated that of the 89% of falls resulting in hospitalization, 46% of the falls involved snowboarders and 43% involved skiers (Ontario Injury Compass, 2006).

Intervention strategies aimed at increasing the awareness of the importance of properly adjusted ski bindings have been shown to reduce falls associated with recreational skiing (Jorgensen et al., 1998). In addition, the same study found that using an instructional video designed to increase the awareness of risk factors associated with falling while skiing resulted in subsequent decrease in fall-related injuries in those who watched the video (Jorgensen et al., 1998).

McKenna and Hammond (2007) note that while snowboarding has an image as a youth sport, a greater number of older adults are now partaking, suggesting that the need for age-appropriate and innovative approaches to the prevention of injury in snowboarding is required. Best practices in this area are likely to combine awareness of proper equipment fit and protective gear with recognition of environmental risk factors.
**Court Sports:** Many fall injuries related to informal court sports (tennis, volleyball, basketball) are the result of unsafe playing surfaces outdoors, as well as slippery or wet playing surfaces indoors. Regular assessment and maintenance of court facilities has been shown to reduce falls while playing these sports, and a more recent study has suggested that balance training would also be beneficial in reducing falls associated with basketball, an assessment that can likely be extended to other court sports (Burnham, Copley, Shim & Kemp, 2010). Improved awareness of the benefit of maintaining appropriate and proper fitting footwear has also been suggested as a successful fall prevention technique in everyday court related recreational sport (McPoil, 2000).

**Life Span Approach to Mid-Life Falls Prevention**

In Canada, the working-age population (those aged 15 to 64) represents 68.5% of the population. This proportion is higher than in any other G8 country, except Russia. This percentage is also representative of the proportion of working aged persons in Ontario (68.4%). Among Canada’s working-age population, 42.4% are in the age group 45 to 64, a record high proportion. Additionally, census data shows for the first time that there are more people aged 55 to 64 in the active labor force, than those aged 15 to 24 (Statistics Canada, 2011). Clearly, Canada’s mid-life population is not only very large, but is also very diverse in that people within this age range are engaged in a number of activities both within the home and outside (e.g., work, sports/recreation, daily living, etc.). It is the position of this paper that by continuing to omit mid-life populations from our study of falls injury, and by failing to address a more holistic, and genuine understanding of precipitating risk factors, falls injury prevention programs will continue
to be deficient. This is so because they will remain incapable of providing a complete portrayal of the complexity surrounding falls injuries. Furthermore, we will continue to be incapable of articulating the connection between risk and protective factors in a holistic and broadly informative sense. As a result, we suggest that explicitly integrating a life span approach to identify strategies that actively address broader social and ecological determinants of falls injuries would help to expand the scientific foundations of injury prevention and further prevention programs. This explicit integration of a life span approach to falls injury prevention begins by filling the gaps that currently exist in our falls injury literature, specifically the mid-life perspective.

Many falls injuries follow acute events and are considered to be relatively sudden in onset (Langley & Brenner, 2004). As a result, it is tempting to focus on the short term and proximal influences on injury (e.g., improper gait, walking speed, polypharmacy etc.), especially when injuries with such a seemingly sudden onset result in so many negative health effects, such is the case with youth and senior populations. However, while such factors are undeniably important, risks of injury need to be seen as interacting system elements, comprising whole units and not as discrete attributes that are merely linked by cause and effect (Volpe, 2004). Moreover, recent academic interest in the nature of person-environment interaction across the life-span has resulted in the recognition that while injuries are typically attributed to sudden events, these are often strongly associated with a number of interrelated components, including personal, cultural, and environmental factors that accumulate throughout the life span. As such, injury can be conceived of as a part of an ongoing flow of events that can be understood by applying insights from developmental science. The transactional nature of falls injury
can be usefully conceptualized to incorporate broader and higher quality interventions aimed not only at addressing falls injury prevention, but also at addressing larger social issues that facilitate risk. Providers of falls-prevention initiatives should be integrating these insights into their current models for injury prevention.

**Injury Recidivism and Mid-Life**

Injury recidivism is defined as the idea of receiving more injuries as a result of a previous injury (Martini, 2010). In the case of slips, trips, and falls, injury recidivism would refer to increased risk for falls as a result of previous falls injury. There are a number of negative health effects to experiencing falls in mid-life that, unfortunately, are capable of being carried over into the senior years, including: (a) improperly healed joints/bones; (b) damaged tendons; (c) the long-term and cumulative effects of concussion injuries; and (d) other soft tissue, nerve, and blood vessel damage. In this section we will discuss how slip, trip, and falls injuries may accumulate over the life span in ways that not only increase one’s risk for falls at the senior age, but also may lead to greater morbidity and mortality.

As noted in the sections above, slips, trips, and falls result in thousands of injuries every year. The most common injury resulting from falls are musculoskeletal injuries (WorkSafe Victoria, 2014). According to the Cleveland Clinic (2014), musculoskeletal injuries refer to a variety of conditions that affect the muscles, bones, and joints. Examples of musculoskeletal injuries include sprains/strains, tendonitis, arthritis, and Fibromyalgia. For slips, trips, and falls, the seriousness of such injuries may only be appreciated as time goes on (especially in cases of cumulative trauma and improper
healing); we need to develop an understanding of the severity of these injuries on later life functioning.

**Ligament Injury**

Ligaments are dense bands of fibrous connective tissue that serve to join two or more bones of the musculoskeletal skeletal system (Hauser, Dolan, Phillips, Newlin, Moore, & Woldin, 2013). Ligament injuries are among the most common cause of musculoskeletal joint pain and disability encountered in primary practice today (Hauser et al., 2013). According to these authors, ligaments heal by a distinct sequence of cellular events that take place in three consecutive stages: an acute inflammatory phase, a proliferative or regenerative phase, and a tissue remodeling phase. The process can take months to resolve itself. In the case of slips, trips, and falls, ligament injuries occur most often to the knees and wrists.

According to (Hauser et al., 2013), any persisting abnormalities present in the remodeled ligament matrix can have profound implications on joint biomechanics. For example, since remodeled ligament tissue is both morphologically and biomechanically inferior to normal ligament tissue, ligament laxity results, causing functional disability of the affected joint and predisposing other soft tissues in and around the joint to further damage. Over many years, this imbalance in joint mechanics can damage the articular cartilage. Since articular cartilage cannot heal itself very well, the damage adds up and in time, due to the abnormal cross-linking of collagen and the smaller diameters in collagen fibrils in repaired ligament tissue, ligament tissue becomes weak; losing strength and stiffness. Evidence suggests that these negative health effects can persist for months, or
even years after the injury (For review see: Hauser et al., 2013). Similar effects are seen in the knees of those who experience ligament injuries as a result of slips, trips, or falls; as well as in the ankle ligaments.

For those in mid-life, treating ligament injuries (specifically with motion therapy) is a relatively successful venture, and most people within this age demographic are able to return to work and resume their regular life activities within months. However, many ligaments, even after rehabilitation and/or surgery, do not regain their normal tensile strength (Hauser et al., 2013). Additionally, individuals who incur ligament damage remain at high risk for re-injury based on the fact that ligament healing is often slow and incomplete, with mechanical laxity and subjective joint instability still being observed in a large percentage of patients (Hauser et al., 2013). These effects translate into greater falls risk in later life because the cumulative effects of ligament injuries caused by early life falls represent factors related to loss of balance and the lack of ability to recover from a fall.

Osteoarthritis (OA) is known to be one of the most common consequences of ligament laxity (Hauser et al., 2013). It is well known that osteoarthritis is associated with increased risk of falls, specifically in those ages 65 and older. Traditionally, OA was thought to be due to aging and wear and tear on a joint, but more recent studies have shown that ligaments play a crucial role in the development of OA (McGonagle et al., 2008; Brandt et al., 2006). Current thinking holds that OA develops when one or more ligaments become unstable or lax, and the bones begin to track improperly and put pressure on different areas, resulting in the rubbing of bone on cartilage (Hauser et al., 2013). Thus, ligament laxity as a result of injury leads to a higher prevalence of OA as
well as secondary effects such as muscle weakness, knee instability, and decreased functional mobility—all of which lead to greater risk for falls in later life.

**Fractures**

Fractures occur at all ages of life. Fracture healing in general is a process with marked complexity also influenced by hormonal, vascular, pharmacological and cell biological factors (Hente, Füchtmeier, & Schlegel, 2004; Lieberman, Pearson, & Polk et al., 2004). The nature and likelihood of later consequences of a fracture depend upon the outcome of the fracture; if fracture union fails, there may be delayed union, or non-union with arrested bone healing.

Proximal Humerus Fractures (i.e., broken shoulders) are common and account for approximately 5% of all fractures (Gozna, 2000). Usually they are seen in elderly patients following a fall on the outstretched arm. However, these fractures are not limited to the elderly population; unfortunately, the most serious proximal humerus fractures occur in the working population (Gozna, 2000). These are high-energy injuries that result in multiple fractures and require surgical intervention of the upper extremities. Therefore these types of injuries can result in significant long-term disability, including stiffness and weakness of the extremities (Gozna, 2000).

Those who sustain low-energy fractures are at increased risk of sustaining a subsequent low-energy fracture (Robinson et al., 2002). In a study on refractures in patients at least forty-five years old, Robinson et al. (2002), discovered that individuals who sustain a low-energy fracture between the ages of forty-five and eighty-four years have an increased relative risk of sustaining another low-energy fracture. This increased
risk was greater when the index fracture occurred earlier in life (i.e., prior the age of 45); the risk decreased with advancing age. From their study, it was concluded that secondary preventative measures designed to reduce the risk of refracture following a low-energy fracture are likely to have a greater impact on younger individuals. Given these findings, one can see that it is important for research on falls to begin extending their work into the mid-life demographic, as it is here wherein the key to primary prevention lies.

**Concussions**

Of all brain injuries, falls account for the greatest percentage (28%) (Bentz & Purzycki, 2008). Over the past several years increased interest in concussion had emerged with commensurate awareness of the potential for significant morbidity. According to the Centre for Disease Control (CDC), concussions can occur from a blow to the body that causes the head and brain to move rapidly back and forth—literally causing the brain to bounce around or twist within the skull. This sudden movement of the brain causes stretching, damaging the cells and creating chemical changes in the brain. Once these changes occur, the brain is more vulnerable to further injury and sensitive to any increased stress until it fully recovers (CDC, 2013).

According to Bentz and Purzycki (2008), younger age has been found to correlate with a greater incidence of concussion and a slower recovery. This issue does not appear to be simply related to the fact that younger individuals engage in activities that may place them at greater risk. Rather, the younger brain appears to be more vulnerable to sustaining injury and recovery may be more protracted or less complete (Berntz & Purzycki, 2008). Emerging evidence has begun to show that individuals with a history of
concussion have long term alterations in cognitive functioning. Indeed, concussion history has been associated with increased rates and early onset of depression (Guskiewicz et al., 2007), MCI and dementia (Guskiewicz et al., 2005). Moreover, in an article by Martini (2010), it was found that concussions had a well-defined, acute effect on motor control with alterations in gait documented up to thirty days post injury in young adults. This investigation also revealed that individuals with a history of concussion, an average of 6.32 years prior, continued to show negative alterations in their gait pattern. In fact, our concussed participants demonstrated slowed walking velocity, increased time in the double leg stance phase, and decreased time in the single leg stance phase of the gait cycle.

**The Importance of Falls Prevention in a Life Span Perspective**

In the section above we highlighted the need for a conceptual shift from a focus on senior and youth populations to that of a life span perspective; including a focus on falls among mid-life populations. The rationale for primary prevention of slips, trips, and falls in mid-life populations is based on the ability of early intervention programs to have both immediate and long term benefits for those who might be injured, their families, and the wider community. These benefits range from the minimization of the long-term impact of falls on the individual, to an overall decrease in estimated cost of injury. Despite the range of benefits however, there are still a number of challenges to be addressed.

Assessing organizational readiness for change is a first step for a successful mid-life falls prevention focus. Feedback from numerous advisors, collaborative workshops, and group meetings revealed widespread practitioner enthusiasm to extend our current
focus of research into mid-life populations. There was multilevel and multidisciplinary enthusiasm for change from youth and senior to a mid-life focus. From CEO’s and lab technicians, to researchers and insurance policy makers, all expressed interest in this organizational change of focus. A key resource for facilitating practice changes was the acknowledgement of primary preventative strategies in mid-life to have the ability to lead not only to decreased falls in a very widespread population, but to also mitigate the negative physical and economic effects of falls that are capable of extending into old age. While at the beginning phases of this research, some communities had falls prevention programs, other communities had low awareness of the prevalence of falls risk and of appropriate interventions for this particular population. The lack of awareness and tools for use in risk assessment or documentation of prevention efforts for falls in mid-life, indicated the need for a change. As an emerging area of interest, identifying and implementing exemplary programs with the aim of preventing mid-life falls in everyday activities is of utmost importance.

**Conclusion**

The above review of risk and protective factors, coupled with an examination of effective prevention practices of falls in adults involved in everyday activities, has yielded practice and programming insights in this currently under characterized field of public health. This review of risk factors and potential areas for programming has shown that effective interventions exist to minimize the social and economic burden of mid-life falls related to ice and snow, everyday activities, and home safety. Identifying and implementing exemplary programs in the prevention of falls in everyday activities is a
necessary and relevant extension of existing fall prevention work, and as such, consideration of this neglected area of injury prevention should be prioritized.

REFERENCES


Section Two:

CASED EXEMPLARY PROGRAMS IN THE PREVENTION OF FALLS IN MID-LIFE

1. The Fallfrit Initiative: Community Systems Falls Prevention

2. Balance Strategy Training

3. Walk With Ease

4. Awareness Through Movement

5. DIY Falls: Take Time Before You Climb

6. Tai Chi for Health
Fallfritt (Fall Free) Initiative: Falls Prevention through Community Intervention

by Danielle Hryniewicz

(population served: mid-life)

Dr. Tore J. Larsson
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To control and reduce fall-related injuries, particularly among women between the ages of 55 and 65, a falls prevention initiative (safety management falls prevention campaign) was structured and implemented between 2006 and 2007.

The Initiative was developed through a collaborative effort involving researchers from the Karolinska Institutet (Sweden), the Royal Institute of Technology (Sweden) and health care practitioners in the Stockholm medical county.

The Initiative is modelled on the idea that falls injury is the end result of a process in which adults are confronted by numerous fall hazards in their everyday environment.

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<tr>
<th>Background</th>
<th>Resources</th>
<th>Implementation</th>
<th>Outcomes</th>
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<td>To control and reduce fall-related injuries, particularly among women between the ages of 55 and 65, a falls prevention initiative (safety management falls prevention campaign) was structured and implemented between 2006 and 2007.</td>
<td>The Geriatric Clinic and the Clinic for Surgery at Södertälje hospital provided helpful cooperation in this project, supporting the research team with non-financial assistance.</td>
<td>A local campaign was launched to recruit falls prevention agents, to inform key target groups in the local community, and to educate people about fall risks.</td>
<td>The Initiative was evaluated through a stratified survey of targeted merchants, prevention agents and members of the public.</td>
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<td>The Initiative was developed through a collaborative effort involving researchers from the Karolinska Institutet (Sweden), the Royal Institute of Technology (Sweden) and health care practitioners in the Stockholm medical county.</td>
<td>Dr. Tore Larsson, the principle investigator of this project, is a Professor of Safety Management and Occupational Injury Prevention at the School of Technology &amp; Health, Royal Institute of Technology, Stockholm. He is also the Director of the Centre for Health &amp; Building (Royal Institute of Technology).</td>
<td>A phone line was initiated to enable people in the local community to call and report risks in their physical environment.</td>
<td>The prevention agents reported visits by project officers and the educational seminars as important sources of information.</td>
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<td>The Initiative is modelled on the idea that falls injury is the end result of a process in which adults are confronted by numerous fall hazards in their everyday environment.</td>
<td>The Initiative was funded by Stockholm Medical Municipality via grants to Drs. Tore Larsson and Lena Borell.</td>
<td>A significant source of concern for developers and prevention agents was falls on snow and ice, particularly given that the Initiative was implemented during the winter months.</td>
<td>The Initiative has been associated with a considerable reduction in hip fractures in Södertälje, and possibly also in the near surrounding areas.</td>
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<td>A pronounced decrease in hip fractures among women 55 years and older was observed by the project’s research team.</td>
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INTRODUCTION

In Europe, North America and other parts of the world, injuries resulting from falls represent a significant public health issue (Stinchcombe, Kuran & Powell, 2014; CDC, 2013; Larsson, Hagvide, Svanborg & Borell, 2010) that is expected to become more salient in the years to come, as the volume of injuries due to falls increases for adults across the life span (Hanley, Silke & Murphy, 2011; Orces, 2010). Knee injuries typically result from falls reported by mid-life adults, with environmental hazards (e.g., snow and ice) often precipitating these falls (Talbot, Musiol, Witham & Metter, 2005). The Swedish Consumer Agency estimates that 25,000 to 30,000 Swedes sustain injuries resulting from falls on snow and ice each year (Luleå University of Technology, 2013). Of these 25,000 to 30,000 people, an average of 3,000 people are hospitalized as a result of these injuries (Luleå University of Technology, 2013).

Injuries resulting from slips and falls on snow and ice are more prevalent in colder climates with heavy snowfalls and regions where frequent shifts in temperature lead to melting snow and refreezing of melted snow to ice (Ralis, 1981). A study undertaken by researchers in the United Kingdom finds that admissions to emergency departments increased 2.85 times following a snowfall where 70% of the pavements were covered by snow (Ralis, 1981). A similar U.S. study reviewing all patients admitted to an urban emergency department for falls following an ice storm reports that a total of 327 injuries resulted in 259 patients (Smith & Nelson, 1998).

A Montreal-based study (Canada) conducted in 1998 notes that the incidence of reported hip fractures increased in mid-December and early January, when compared to other months during the year (Levy, Bensimon, Mayo, & Leighton, 1998). An analysis of
falls by Ontarians (Canada) on snow and ice shows that fractures accounted for the majority of the cases, with sprains, other musculoskeletal-related injuries and head injuries accounting for a significant number of the injuries reported (Canadian Institute for Health Information, 2005). In 2002 to 2003, 11,919 Ontarians visited emergency departments as a result of falls on snow or ice (Canadian Institute for Health Information, 2005). Thirty percent of these visits took place in the month of February (Canadian Institute for Health Information, 2005).

Studies conducted in recent years have also analyzed fall injuries from snow and ice in terms of the location of the injuries, the gender distribution of the injuries, and the time of day the injuries took place. The Workers Compensation Fund in the U.S. reports that 80% of slips and falls due to snow and ice occur in parking lots and on sidewalks, with more than 50% of the injuries taking place between 6:00 a.m. and 12:00 p.m. (2009). Bjornstig, Bjornstig and Dahlgren’s study (1997) considers age and gender of Swedes sustaining fall injuries from snow and ice. It was found that most injuries were sustained by women ages 50–79, with men ages 20–29 sustaining the highest number of injuries of the male study participants (Bjornstig, Bjornstig, & Dahlgren, 1997). Interestingly enough, a 2009 analysis of emergency department visits in Ontario demonstrates that an equal number of men and women sustained fall injuries relating to snow and ice, with groups of men and women ages 75–79 years reporting the most emergency visits of all groups included in this study (Ontario Injury Prevention Resource Centre).

In addressing snow and ice and other risk factors associated with falls, researchers have traditionally developed fall prevention programs that centre on balance training
and/or walking training (CDC, 2013; Hanley et al., 2011). Although these programs present operational challenges, the beneficial effects of this type of programming have been well documented (Robertson, Gardner, Devlin, McGee, & Campbell, 2001; Tinetti, Baker, McAvay, Claus, Garrett & Gottschalk, 1994). For example, multi-factorial programs that are run by people in the local community have been shown to reduce fall risk factors significantly (Larsson, Hagvide, Svanborg & Borell, 2010). In fact, these types of programs typically demonstrate a reduction in injury of between 6% and 33% (McClure, Turner, Peel, Spinks, Eakin & Hughes, 2005; Vassallo, Vignaraja, Sharma, Briggs & Allen, 2005; Clemson, Cumming, Kendig, Swann, Heard & Taylor, 2004; Weatherall, 2004; Day, Fildes, Gordon, Fitzharris, Flamer & Lord, 2002).

Community intervention approaches to the prevention of falls and other forms of trauma have resulted in long-term reductions in the incidence of trauma in Sweden, Australia, Canada, the United States, and other countries. The term “community” in “community intervention approaches” refers to the setting of the intervention, which takes place within community institutions (e.g., neighbourhoods, schools, churches, work sites, voluntary agencies) or citywide, through the use of mass media and/or other communication mediums (McLeroy, Norton, Kegler, Burdine & Sumaya, 2003). Various levels of intervention may be employed, including educational strategies that involve individuals, families, social networks, organizations and public policy (McLeroy et al., 2003). Community intervention approaches may also engage community input through advisory committees, community coalitions and/or specialist agents that provide their expertise to assist in tailoring interventions to specific target groups, community characteristics and intervention objectives (McLeroy et al., 2003).
The “community as target” model, a type of community intervention in which the community serves as the target of change, is employed by program developers who seek to create healthy community environments through broad systemic changes in public policy and community services. Health status characteristics, such as risk of falls, are the specific targets of interventions and community changes (Hanley et al., 2011). For example, education programs that employ the community as target model and aim to increase awareness of the risks associated with falls have demonstrated beneficial effects in numerous contexts (Gillespie, Robertson, Gillespie, Sherrington, Gates, Clemson & Lamb, 2012; Hanley et al., 2011; Larsson et al., 2010). Peer-delivered education has been shown to promote greater participation, to improve falls-prevention awareness, and to encourage proactivity in participants with respect to minimizing or avoiding prospective falls (Hanley et al., 2011).

In sum, there is evidence to suggest that fall prevention programs directed towards hazards in the home and local community/environment can decrease the risk of falls in adults and increase cost-savings within the health care system (resulting from the complications associated with unintentional injury due to falls).
BACKGROUND

“Together we want to equip ourselves to minimize and remove risks of falls”
Mission Statement, Fallfritt Initiative

Current Program

The Fallfritt (Fall Free) Initiative, a safety management and falls prevention campaign, was developed and implemented between 2006 and 2007 in Södertälje, Sweden. At the time this program was developed and implemented, Södertälje, located 35 km south of Stockholm, had a population of 80,000 (Larsson et al., 2010).

A local network for safety management and fall prevention was created around a community health centre in the industrial town of Södertälje. Researchers from the Karolinska Institutet, the Royal Institute of Technology and health care practitioners in the Stockholm medical county, collaborated to create this program (Larsson et al., 2010).

Program developers sought to control and reduce fall-related injuries, particularly among women aged 55 to 65, by educating community members about fall risks (Larsson et al., 2010).

Conceptual Model

This program is modelled on the idea that fall-related injury is the end result of a process; a process in which an adult is confronted by numerous fall hazards in his/her everyday environment. Within this model, the prevention of unintentional injury due to falls requires that a person control these hazards by applying his/her knowledge of falls prevention. Prevention agents (e.g., neighbours, friends, carers, merchants, service
providers), who are knowledgeable about falls, the individual at risk, and the potential hazard, impart this knowledge to people within their local community (Larsson et al., 2010).

Influential Services/Studies

Peninsula Health Falls Prevention Service

The structure of the Fallfritt Initiative is rooted in the logics of the Peninsula Health Falls Prevention Service, a multidisciplinary effort that provides specialist assessment, advice and support to individuals and health care workers/organizations that deal with falls-related problems. The Peninsula Health Falls Prevention Service is committed to International Best Practice (Peninsula Health, n.d.).

Established by the Victorian Government, the Peninsula Health Care Network was enacted in August, 1995, following the recommendations of the Metropolitan Hospitals Planning Board (Peninsula Health, n.d.). The Network promotes primary falls prevention activities to healthy, older, community-dwelling adults, including the dissemination of falls information and strategies to promote healthy aging, and the maintenance of mobility, function and independence. Secondary prevention strategies are
communicated to those who have been identified as being at risk of falls or who have already fallen (Peninsula Health, n.d.).

Network partnerships were established and enhanced with various local community partners, including health care providers. Initiatives and procedures employed by the Network were focused on the need to improve continuity of care (Peninsula Health, n.d.).

*Harstad Injury Prevention Study*

The developers of the Fallfritt Initiative were influenced by the work of Ytterstad, Smith and Coggan (1998) on community-based injury prevention programs (Personal Communication, 2014). Ytterstad et al. (1998), building on their earlier work, set out to describe the long-term effectiveness of a community-based program targeting the prevention of burns in young children. Using a quasiexperimental research design, Ytterstad et al. (1998) reported on the effectiveness and sustainability of this program based on changes in burn injury rates, mechanisms of injury, severity, and short term hospital care costs, within the Norwegian city of Harstad (main intervention community) and surrounding municipalities (intervention diffusion and reference communities). Intervention strategies ranged from the purchase and installation of cooker safeguards to the formation of a cross-sectorial injury prevention group in which “cooperation partners” (Ytterstad et al., 1998, pg. 178) were invited to share their knowledge and experience on this issue. Ultimately, it was found that a program targeting burns in children can be both effective and sustainable, with local injury data providing the stimulus for community action (Ytterstad et al., 1998).
Financial Resources

The Fallfritt Initiative was funded by Stockholm Medical Municipality via grants that were paid in part to Dr. Tore Larsson and Dr. Lena Borell (Larsson et al., 2010). The initiative cost approximately 0.8 MSEK (Million Swedish Kroner) or $117,206.80 (U.S. Dollars), in staff and information materials; monetary gains were not measured for this project (Personal Communication, 2014).

Human Resources

The program was run jointly by the Karolinska Institutet and the Royal Institute of Technology, together with the City of Södertälje (Personal Communication, 2014). One Master of Public Health (Karolinska Institutet) was produced through this project.

- Karolinska Institutet is one of the world’s leading medical universities, accounting for over 40% of the medical academic research conducted in Sweden.

- Karolinska Institutet's mission is to improve people's health through research and education.

- The Royal Institute of Technology (KTH) is one of the leading technical universities in Europe. It is highly respected worldwide, especially in the domains of technology and natural sciences.

- KTH plays a central role in the newly formed European Institute of Innovation and Technology (EIT).
The Geriatric Clinic and the Clinic for Surgery at Södertälje hospital collaborated and cooperated with the research team, providing non-financial assistance, as needed (Larsson et al., 2010).

**Principle Investigator**

Dr. Tore Larsson, Professor of Safety Management and Occupational Injury Prevention at the School of Technology & Health, Royal Institute of Technology, Stockholm, was appointed Director of the Centre for Health & Building (Royal Institute of Technology) in 2008.

Dr. Larsson’s PhD thesis “Accident Information and Priorities for Injury Prevention” (Department of Work Science, Royal Institute of Technology, Stockholm 1990) established the paradigm for claims-based Occupational Health & Safety (OHS) information systems. He has been instrumental in developing the new European Union standard for occupational injury information (2000). His research areas of expertise include accident and injury analysis, models and systems for injury prevention, strategic and corporate systems for OHS, occupational risk assessment, and the implementation of worksite change.

Since 1996, Dr. Larsson has authored more than 150 published articles and numerous video manuscripts for the Swedish National Board of Occupational Health and the Joint Industrial Safety Council.
IMPLEMENTATION

Intervention

The Fallfritt Initiative involved an information and education campaign, which required the development of a safety management network. In building the local safety management network, program developers first recruited potential agents in the local community, who were contacted and informed about the Initiative and/or given a pamphlet about fall risk and applied prevention (See Appendix A & B) (Larsson et al., 2010). All operators of gyms and fitness centres, as well as opticians, shoe merchants and podiatrists within the intervention area of Södertälje, were visited by a member of the research team. Confirmed prevention agents were invited to attend a series of half-day seminars on fall prevention at the local University campus (Larsson et al., 2010). The prevention agent group (n = 32) ultimately consisted of seven pharmacists, eight opticians, four podiatrists, four shoe merchants, four facility managers, three gym staff and two representatives of senior citizens’ organizations (Larsson et al., 2010).

Campaign

As mentioned, an information campaign was initiated in order for the research team to contact all potential prevention agents. This campaign included the distribution of an information folder about how to prevent falls, which was later redesigned into a wraparound four page cover for the education campaign. The education campaign, which targeted adult members of the community ages 18 to 65, included the dissemination of the redesigned four page cover within the local newspaper and directly to community members via mail (with a distribution of 30,000 copies) (Fallfritt Södertälje, 2007).
Local Phone Line for Reporting Risks

Just prior to the rollout of the information and education campaigns, a local fall risk reporting phone line was set up in cooperation with the local community. The phone line was initiated by the Södertälje municipality to enable people in the local community to call and report potential hazards and fall risks in their local physical environment. The phone line was open 24 hours a day, seven days a week (Larsson et al., 2010).

When a potential risk was reported to the municipality, it was assessed and appropriate actions were taken. While the campaigns were being implemented in January and February, 2007, a campaign poster, which advertised the fall prevention telephone line, was run on the side of buses and in the local newspapers (Larsson et al., 2010).

"On the way to work, I suddenly saw a woman fall on the sidewalk. After helping her up, we noticed that some tiles had fallen due to potholes. I tipped her fall hazard line and promised to call to report such a manifest danger of falling.

When I came by two days later they had filled up the hole and smoothed out the plates. It felt good."

-A fall hazard agent, Vårberg

Special Considerations

In this project, a significant source of concern for developers and prevention agents was falls on snow and ice, particularly given that the Initiative was implemented during the winter months. Falls on slippery surfaces, such as snow and ice, are significant
in that these hazards affect adults across the life span, and can result in debilitating injury with cost implications for both health and job sectors.

Research on snow and ice falls is timely and increasingly relevant, as researchers in various countries are now being commissioned to investigate the issue and to provide recommendations for public policy. At Luleå University of Technology (Sweden), for instance, Glenn Berggård, Agneta Larsson and Peter Rosander are currently working to develop a Swedish standard for anti-slip devices, as well as for winter shoes and shoe soles (Luleå University of Technology, 2013). Commissioned by the Swedish Transport Administration, Berggård and his team are investigating pedestrian footwear to be developed to prevent slips on falls and ice; testings required for the development of a Swedish standard, as well as Nordic and European standards; and, existing information gaps and future research needed in this area (Luleå University of Technology, 2013).

"I absolutely believe that it is possible to develop a Swedish standard for anti-slip devices, winter shoes and outsoles. Considering how many people are injured each year in Sweden because of falls due to slippery ice and snow, and what it costs society in terms of health care costs, this is important"

–Glenn Berggård, Project Manager and Researcher

Berggård and his team were scheduled to begin tests on ice in May, 2014, at the indoor Sunderbyn Rink, Luleå University of Technology. In addition to the ice tests, reference tests will be conducted to measure participants’ feet, legs and performance on
balance exercises. The reference tests will also collect data on how the participants walk under normal conditions on a dry surface (Luleå University of Technology, 2014).

Outcomes

In the summer of 2007, the Fallfritt Initiative was evaluated through a stratified survey of targeted merchants, prevention agents and members of the public (Eriksson & Landin, 2007).

The research team conducted structured, qualitative interviews with 82 men and women living in Södertälje (local residents). One out of three of the prevention agents (including the prospective prevention agents) were also selected for these interviews. Interviewees participated in a short interview taking place in the central shopping mall of the local town (Larsson et al., 2010).
**Feedback on Campaigns and Phone Line**

The results of the qualitative interviews demonstrate that 72% of the prevention agents approached by the research team were reportedly aware of the campaign. The corresponding proportion among the local residents (n = 82) was 20% (Larsson et al., 2010). The most effective sources of information reported were newspapers and pamphlets (Larsson et al., 2010).

The educational seminars provided to the prevention agents were also found to be an important source of information (Larsson et al., 2010). Finally, the podiatrists, facility managers, gym staff and senior citizen representatives interviewed all reported active involvement in the campaign (Larsson et al., 2010).

The use of the local phone line was also evaluated by the research team. Twenty-nine (29) calls were reportedly received by community members during the period between January and May, 2007. The potential risks and hazards identified related to snow and ice, stumbling risks in the streets, pot holes and loose gravel (Larsson et al., 2010). A round of visits to the reported sites in June, 2007 showed that most of the risks reported had been addressed (Larsson et al., 2010).

**Medical Records**

The research team collated all medical records on cases of hip fracture and fractures on radius that were sustained by Södertälje residents (treated at the local hospital) during 2005, 2006 and 2007 (Larsson et al., 2010). In-patient data on radius and
hip fractures treated at the local hospital were thus compared for the years 2005, 2006 and 2007 (Larsson et al., 2010).

In addition, recorded traumatic fractures, luxations and distortions to hips or thighs reported in the Swedish National In-Patient Register for 2005, 2006 and 2007 were extracted by the research team to allow for comparisons to be made between local incidence rates and national rates (Larsson et al., 2010).

The total gender-specific and age-specific frequencies were compared with the number of residents in the Södertälje, in order to estimate potential changes in the incidence of hip fractures (Larsson et al., 2010).

**Incidence of Falls in the Local Community**

It was found that the incidence of hip fractures sustained by Södertälje residents dropped by 16.7% between 2005 and 2007 (Larsson et al., 2010). While the number of inhabitants in Södertälje increased by 4% during the study period, no changes in the distribution of hospital services were undertaken during this period (Larsson et al., 2010).

The reduction in hip fracture incidence for women 55 years and older was similar to that observed within Södertälje; a drop of 15.5% was observed between 2005 and 2007, with the reduction in years lost to disability at approximately 40% (Larsson et al., 2010).

The most pronounced reduction in fracture incidence was among women 55 years of age or older living in special accommodation. The number of such dwellings in Södertälje during the time of study was 434. Between 2005 and 2007, the hip fracture incidence for this group was reduced by 44.4% (Larsson et al., 2010). In contrast, the
reduction of hip fractures for women 55 years and older who resided in their own homes was significant at 5.7%, with the years lost to disability totalling 28.4% (Larsson et al., 2010).

The reduction of hip fractures for men 55 years and older in Södertälje during the same period also dropped by 12.2% (Larsson et al., 2010).

Taken together, a clear reduction in hip fracture incidence and years lost to disability is evident at 25% and 48.4%, respectively (Larsson et al., 2010). These figures include all treated hip fractures at the Södertälje local hospital between the years of 2005 and 2007, including the surrounding municipalities serviced by the hospital included. It should be noted at this time that the absolute numbers of hip fracture incidents for all groups discussed are small (Larsson et al., 2010).

An important point to note: the reduction of injury incidence in the Södertälje area between 2005 and 2007 is notably larger, when compared with national data (Larsson et al., 2010).

**Future Considerations**

This Initiative has been associated with a considerable reduction in hip fractures in Södertälje, and possibly in the near surrounding areas (Larsson et al., 2010). The intervention strategy selected by the research team seems to have been an appropriate and effective choice, with local media—newsprint—remaining the major source of information about fall prevention for this project (Larsson et al., 2010).

As one might expect, the people closest to the fall risk problem tended to take a greater interest in the issue (Larsson et al., 2010).
hip fractures among women 55 years and older might be partially explained by an increased sensitivity to and awareness of fall injury and prevention experienced within this group (Larsson et al., 2010). Given that women who work in social service and in the care of the elderly are a group known to be afflicted themselves by falls, it is possible that this group is more aware of the potential hazards, risks and resulting effects, and thus also more knowledgeable about how to prevent falls (Larsson et al., 2010). Future initiatives might consider how the typical precursor(s) to severe falls can be analyzed in terms of exposure, environment and distribution. This could be beneficial in that it could set priorities for prevention and for the safe design of the home and the local community environment (Larsson et al., 2010).

Future initiatives might also consider the significant impact of falls on snow and ice for mid-life and older adults. With snow and ice posing a very real fall risk for community-dwelling adults across a number of continents, preventative efforts (e.g., warning signs, salt/sand bins) should be taken to address potential risks and hazards within the environment. As in the case of the current initiative, ongoing feedback received by local prevention agents from community members on snow and ice hazards should be taken seriously, and acted on immediately.
CONCLUSION

Efforts that aim to prevent falls in the local community can be more cost-effective than efforts to prevent falls only within the groups that have traditionally been viewed as being at high-risk for falls (e.g., adults ages 65 and older) (Larsson et al., 2010). Cost-effectiveness aside, the community intervention approach to falls prevention can also benefit adults across the life span (as well as children, youth and adolescents) by raising awareness of the detrimental personal costs (e.g., physical and psychological costs of long-term recovery from injury) associated with unintentional injury caused by falls, and the corresponding need to actively prevent such injuries, where possible.

Although the Fallfritt Initiative has not been replicated since its rollout, researchers have since referenced the initiative and the strengths of the community intervention approach to falls prevention (Goodwin, Jones-Hughes, Thompson-Coon, Boddy & Stein, 2011; Hanley, Silke & Murphy, 2011). In particular, Hanley et al. (2011) note that community-based initiatives aimed at increasing awareness of the risks associated with falls are both cost-effective and effective in achieving stated objectives (e.g., decreasing the incidence of falls within a community). Within multidisciplinary falls prevention strategies, such as the Fallfritt Initiative, a high-degree of collaboration and communication takes place amongst public health care professionals (or prevention agents) and local community members (Hanley et al., 2011). Multidisciplinary strategies that are implemented at the community level offer large-scale collaboration and knowledge transfer, cost-effectiveness and effectiveness in achieving stated aims and objectives (Hanley et al., 2011).

In sum, the Fallfritt Initiative requires a view of prevention that is focused on remedial action—risk reduction through the elimination of hazards in the built
environment and the design of safe living conditions for all community members. Strategies such as this call for an increased awareness of how processes can reduce risks to prevent falls. Moreover, such strategies must start outside of the health sector, within the local community (Larsson et al., 2010). Prevention agents, those in the community with special expertise in fall risks, should be defined as a permanent part of local public health efforts and allocated resources that accompany traditional health care (Larsson et al., 2010).
REFERENCES


HUR BLIR JAG EN VARDAGSHJÄLTE?

Hur kan jag vara med och minska antalet fallskador?
Varje dag dyker vardagshjälter upp i samhället. Vad skulle t.ex. föreningsslivet vara utan alla som arbetar uted! Men att vara en vardagshjärta behöver inte kosta dig så något. Många gärna gör det till en ansvarsfullt elevad.

Som vardagshjälte kan du:
- Uppmärksamma och anmäla risker i samhället som kan leda till olyckor. Du kanske hade tur men risken finns alltid när den som räcker illa ut.
- Hålla kontakt med dina grannar och fråga hur de mår.
- Erbjuda lite hjälp när någon frågar.
- Erbjuda hjälp när någon inte vågar fråga efter den.
- Göra de ”självdjärna” sakerna som att hälla upp dörren eller hjälpa någon över gatan.
- Ta del av innehållet i den här broschyrans omslag som beskriver vad som ökar risken för fall och vad man kan göra för att minska fallrisken.
- Spara telefonnumret till Fallrisklinjen, som finns i broschyrans, för att ha det till hands när du uppmärksammar en uppenbar fallrisk.

ALLA KAN GOERA NÅGOT...
Varför skulle jag oroa mig för att falla?
- Fall är den vanligaste olycksorten till stora delar över 65 år.
- 1 av 3 över 65 rapporterar minst en gång om året.
- 1 av 5 av fraktur på grund av fall
- 1 av 3 frakturerar sitt övervanns med höjd är frakturerings
- 1000 personer över 65 dör varje år på grund av falllycka.

Är inte fall bara en del av att bli gammal?
Och man ser att det inte är alls ovanligt att falla i sitt hem och behöva hjälp.

FALLFRITTTGUIdEN

Vilka fallrisker borde vi vara oss för?

Frågo dig själv:
- Får jag falla i en vanligt situation näringsrikt av en annan manskabel situation?
- Kan jag något av dessa faller?
- Får jag vara tvungen att falla på grund av faller?
- Poverkade faller men påvärkligt?
- Får jag av fallet på grund av faller?
- Är min önskedom situationen? Om ingenting som orsakade fallet fortfarande att problem?

Om du svarar ja på någon av frågorna är det en vanskogssignal.

HÅLL DIG I RÖRELSE – DET GÄLLER LIVET


Josef Drin: Förest

Riskera jag att falla?

- Jag har svårare att falla av grund av resolution, hjärtfjäder eller andra problem.
- Jag har svårare att falla av grund av andra problem.

Fakta

Fysisk aktivitet är mycket olycksdäckande. Det är bra för det hjärta, men också för det hjärta och när det är bra för de som har hjärtans sjukdomar och kinesens. Speciellt det väsentligt att vi inte fallar lika oftast för livsförlust och olycksdäckande. Det är viktigt att vi fallar lika oftast och att vi fallar lika oftast.

Kontakt

Doktor för肪 i våren är en av de främsta ställen i våren.

Dagliga promenader ger inte bara motion utan även en del osteoporos-hämmande D-vitamin genom sollysset.
MEDICINSKA PROBLEM

Tillsammans kräver jag att jag kan kommunicera med samtliga patienter. Jag vill vara en del av dyrtaktiken, och jag vill också vara en del av de personer som hjälper till att ta hand om alla." Företaget har också börjat arbeta med nya mediciner och rekvirerat meg att jag är en del av det. Jag har inte medvetet någon innebörden i det som ges.

Eva 72 år och Connor 78 år,Rendering

Försiktighet
- Ta med sig din läkares prescrition när du är i sjukhus.
- Avstå från medicinhantering som kan orsaka alla oavsiktliga effekter.
- Undvik att ta mediciner och drikka alkohol samtidigt.
- För att tydligare medarbetare och Patienter ska ha ett bättre förstånd av medicinerna genom att i allmänhet varje natt till öppningen av det läkares hjälp också

BALANS, STYRKA OCH FALL

När personen eller man blir speciellt åldrig och eller störd kan man falera i trappor på tornen. Den effekten hos de speciella åldrar och man kan dagvis ha en större risk för att falla. Det finns några speciella observatoriet som man kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på och han kan börja att tänka på.

Förebygande
- Här trappor kan man använda sig av treklippar eller kycklingar.
- Man kan också använda sig av en eller två klippar.
- Man kan också använda sig av en eller två klippar.
- Man kan också använda sig av en eller två klippar.
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- Man kan också använda sig av en eller två klippar.
- Man kan också använda sig av en eller två klippar.

Kontakt
- Besök deras webbplats och läs deras Legislation och ställ frågor om de vill ha mer information.
- Om du har några frågor, kontakta patientens föräldrar och deras därnärm."
SYKEN


Kundutbildning och Frank EVS Söderåsens

Ökad fallrisk för dig som:

- har svår att se klart och följa ruten
- har svår att gå i exakt ritning i mörker med starka ljussnövatten
- har svårt att se objekt på marken
- inte har undervisats synen på 12 månader
- har svårt att promenera med bifokaler/progressiva glasögon
- har lärt några gånger över saker du inte sett.

FÖRSLAG

- Tar du dig en gång en fort.
- Förbättra för dig läsrita eller optiker de läsritningar där du ser på grund av problem med synen.
- Minstakansena på träkroken så ser du dem bättre.
- Gör eller få hjälp med att göra en natt

KONTAKT

Di läsrita eller läsrita optiker vil goda resta om dina syn förmåner.

RÄDD ATT RAMLA?


Göran EVS och Göran JO Stenbo

Riskera din vän att falla?

Göran

Börja med aktiviteter för att inte ramla.

- Vänta att hon/han kan läna av att göra många saker men är rätt att ramla.
- Börja inte så aktivt som innan hon har ramlat.

Bortfylla


Förelägg

Var medan man inte förlorar att falla när du går eller om du minirät, att promenerande. Om det är så, och hjälper Persona
ten på vändskyddet förstå dina problem och kan hjälpa dig att få till dem. Om du kan tappa kan ett sedan en tredje tala att generera dig trysta på att göra regler och som är, kontakta oss, du pass att du skulle få hjälp om du reser igen. Sök kontakt med goda och vikar, en kompaktna verande!

Kontakt

Tala med din läsrita om de om du vill falla och vad du kan göra åt dem. Personalen på vändskyddet kan bedöma din situation och hjälpa dig bättre din dom och lika din sakhet.
VADE ÅTER

597

FOTTER OCH SKOR

Vem riskerar att falla?

Vi som har

• skor och tofflor med halta salor.
• skor med små klackar.
• skor som är gamla och slitna.
• skor som är öppna i hälén.
• skor som är för stora eller för små.

Om du markedat någon av frågorna ovan bör du kontaktta din vårdcentral.

Vem riskerar att falla?

• Vis som nyfiken har gitt ev. i svakt.
• Vis som har riklig sprit.
• Vis som har osteoporos.
• Vis som tycker det är svårt att handla när näringsviktiga mat vi behöver.

Vis som är mindre än tre portioner mejeriprodukter dagligen.

Vad du kan göra

• Att allt tre portioner balanserat mat om dagen, t.ex. mjölk, ost, yoghurt, lax, grön biffkärntost.

Fakta

En balanserad diet är mycket viktig under högtirv. När man blir äldre är det viktigt att bibehålla en rimlig av balans och giltiga visar att kostnaden av friday och mässan. Jämfört med snabbt, ökade risker att återfallet, se en doktor med 10%. När skärmens tät plast och musk är mycket lätt kallas detta för osteoporos.

Adresser:

• Ringer fallrisklinjen.
• Sluts till att vara vanad och näringsviktigt mat varje dag.

Ringer fallrisklinjen!

Kontakt

Din vårdcentral, gäller till doktorn eller sköterskan, om du vill få råd om kostnaden. Prova med vändkretsklot, ravioliprodukter, och alla fel som äter åt få råd på vårcentralen.

Morgonen 73 år och Svei-örtens specialist/författare. Skriftbonen

RING FALIRISKLINJEN!

Kontakt

Gäller till doktor eller sköterskan, om du vill få råd om kostnaden. Prova med vändkretsklot, ravioliprodukter, och alla fel som äter åt få råd på vårcentralen.
BO KVAR HEMMA


Hemhjälstavsanvisningar är mycket bra idéer och mycket emotiskanvända och roliga. Arbetstavsanvisningar kan också vara ett gott alternativ. Den berättar att du har ofta faller på maträttar, skador och att det inte särskilt bra att ha en fallskärm.

Elisabeth 70 år, Halmstad

Riskera jag att falla?

- Jag har vårt med sina dagliga aktiviteter.
- Jag har vårt att driva och/eller att bli mig.
- Jag känner mig osäker när jag arbetar i fråga.
- Jag känner mig osäker när jag går runt i boodden.
- Jag känner mig osäker när jag går på ojämna underlag.
- Jag vet att det finns fallskärm i och runt om boodden.

Förslag


Du fortsatt ibland fallskäden händer i boodden, så det är rätt att göra hansesten. Diskera att du har drabbats av en fallen och att dina skador, plecar börda med eventuella risker och ändå som regel där man går. Se till att din egen bok och handtag där du befinner.

Arbetsomständigheter kan ge dig råd om du gör boodden fallskärm och har kommande fallskärmshjälp och andra hjälpmedel.

Kontakt


RISKER I LOKALSAMHÅLLET

På någ otidigt såg jag på en komma riktnings på trottoaren. Efter att ha haft boodden kom anmärkningar om att någon plats hade sjunkit på grund av fruktbar. Jag trampade genom de fallskärmshjälp och levde att jag stod för att se om en annan person fallskärm.

När jag honom någon som jag letar igenom och jag ansökte om platsen.

Kas fallskärmshjälp, Halmstad

Riskera vi att falla?

Vi vet att det finns trottoarer i vårt område som
- har sprickor och oböjda.
- är sprickor och oböjda.
- är utformat utformade.

Vi behöver att en riktnings i lokalsamhället som
- kan göra att man rörliga eller gamla.
- är en begränsning för en person som har svårt att gå.
- är en riktnings som har svårt att gå.

Vi vet att det finns ställen där
- genrer och bukser är i vägen när man går.
- onödigt nyhet av en bra vilje.

FACER

Många fallskärmshjälp sträcker sig, f.d. sprickor på trottoarer och på platsen med omgivande miljö. Genom att göra något att förbättra fallskärmshjälp och risker för personer med funktionsnedgång. Om du ansöker att det finns fallskärmshjälp och risker för personer med sprickor på trottoarer och på platsen med omgivande miljö, då inte fallskärmshjälp.

KONTAKT

Det kommer att komma ut, att sprickor på trottoarer och på platsen med omgivande miljö.

Blir en meddelad Ring och uppmärksamma de risker du ställer på.

Nästa person som passerar kanske är den som råkar till ut.

98
OM JAG RAMLAR

En dag ramlade jag i trädgården och reste inte hur jag skulle komma upp. Jag prova-
lade mig i huset och förödte nummer mig på att per stab liksamt att lyckas. Till sid-
ade jag var inhems för inlock och ringde min dotter. Hon skulle inte komma och hjäl-
pa mig på ett par dagar, så det var tvungen att jag inte fick bli tag på inhemsens.

Karin Olofsson, Embede

Planera i förväg vad du gör om du skulle falla

Att ha en plan kan känna tryggt, men vat vad man ska göra.
Några förslag:
• Avtalet med en daglig signal med en grönne (vaikutande upp-
på morgonen).
• På en familjenmedlem eller vän ringer varje morgon.
• Om du kommer upp från golvet när någon familjenmedlem är närvarande.
• Om du inte lyckas komma upp på egen hand när du över-
kontakta värdcentralen eller hemförvaltan så att en sjukgymnast kan komma och lära dig hur du ska göra.
• Se till att telefonen står så att du kan nå den från golvet.
• Tala på vad du ska göra om
  - du ramlar
  - du rullar
  - du rinner

Om du faller
• Om du kan
  - rulla över på magen och förvis komma i knäfallet. Knäna dig fram till en stablig mobel, t.ex. en fotstol eller soffa. Förvis komma upp på knä. Tryck dig upp med ditt starka ben och ditt starkaste arm, mena-
dan du fortsätter hålla dig i mobeln. Sitt ner i mobeln.

Om du inte kan komma upp
• Förvirra att knäna efter dig till en magen och förvis hålla dig och förvirra någon när du kan. Förvis bli inte rå-
gen dera fort eller ned i golvet med, t.ex. med en tjock sågat or knyckla.
• Förvis att koppla av
  - Om du vet att ingen kan höra dig, tala dig våra och förvis att komma upp igen sen-

Om du har markerat någon av ovanstående punkter
  - hur du kontakta din värdcentral

Riskfritt betyder inte alltid fallfritt!
Södertälje blir fallfritt!

I städerna har projektet Fallfritt Södertälje gått med en utkomst som innebär att minsta delen av folkbockar med snitt 25% av tiden är i ett fallfritt område. Södertälje, som även innefattar Göteborgs kommun, har efter en period av otillräcklig tätning i områdesverksamhet och högen begagnning av en tätning av en del av bebyggelsen, sedd en stark förbättring.

En faktor som spelar en avgörande roll i tätning av områden, är att minska risken för högare fallfrihet. Genom att öka tätningen på landet samt genom att öka tätningen på marknaden för bostäder, är det möjligt att minska risken för högare fallfrihet. Genom att öka tätningen på landet samt genom att öka tätningen på marknaden för bostäder, är det möjligt att minska risken för högare fallfrihet.

Detta innebär att det är viktigt att vidta åtgärder för att öka tätningen på landet samt genom att öka tätningen på marknaden för bostäder, är det möjligt att minska risken för högare fallfrihet.

FALLFRITT! 020-550 100

VIKTIGA TELEFONNUMMER:

<table>
<thead>
<tr>
<th>Södertälje</th>
<th>Göteborg</th>
<th>Stockholm</th>
<th>Uppsala</th>
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<td>020-550 100</td>
<td>03-950 45 00</td>
<td>08-550 12 34</td>
<td>08-550 56 78</td>
</tr>
</tbody>
</table>

Information om fallfrihet:

- Detta projekt finansieras av staten och kommunerna.
- Mer information om fallfrihet finns på www.fallfritt.se.
APPENDIX B

FALLFRITT INITIATIVE FOLDER

(English Summary of Key Campaign Messages)

• Many falls in the local community affect active, healthy older people and disabled people. The municipality, street office and property owners need to receive reports on environmental risk factors relating to falls. If you believe there are gaps or problems that may involve injury risks in buildings, walkways, bike lanes, pedestrian crossings, stairs, and platforms or elsewhere in your community, call the Fall Hazard line.

• This Initiative is a new way to raise awareness of falls among Södertälje inhabitants. Through the creation of a network where not only health professionals, but also organizations, shops, businesses, and private individuals (like you) are involved, we create the potential to reduce the number of falls. The purpose of the Fallfritt Initiative is to effectively identify risks before an accident takes place.

• Every community member can become a “local hero” in falls prevention by:
  
  o Maintaining an awareness of and reporting risks in society that can lead to injuries;
  o Keeping in contact with your neighbours and asking them how they feel;
  o Offering some help when someone asks;
  o Offering help when someone does not dare ask for it;
  o Making the “obvious” things like holding the door open or helping someone across the street;
  o Taking note of the contents of this brochure that describes that which increases the risk of falls and what you can do to reduce risks; and,
• Saving the phone number to the Fall Hazard line (available in the brochure)
  to have on hand when you notice an obvious risk of falling.

Why should I worry about falling?

• If one takes responsibility for their health and becomes aware of the early warning signs, he/she can postpone the effects of aging, avoid being dependent on help and maintain their mobility!

• Falls are not an inevitable part of aging—prevention can save your life!
Balance Strategy Training

By Marina Bourlak and Danielle Hryniewicz

Balance strategy training

**Population Served:** Mid-life

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<table>
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<th>Background</th>
<th>Resources</th>
<th>Implementation</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originated at the Division of Physiotherapy, School of Health and Rehabilitation Sciences, University of Queensland</td>
<td>The pilot projects was completed through governmental grants. Program is no longer funded by any source. Non-financially supported through physiotherapists, the Australian Physiotherapy Association, and fellow research colleagues.</td>
<td>Can be applied in a group or individual. Comprised of 11–15 activities, plus stretching. Workstation delivery model. Each workstation is designed to focus on a specific task, including strength and flexibility training, cardiovascular training, muscle. To increase difficulty, activities include adding surfaces and visual challenges to promote attention and multi-tasking. Each workstation is designed to accommodate various levels of ability. Current: ISAFE program &amp; Health Service Research Unit at Monash University.</td>
<td>Balance strategy programs are effective in improving balance and mobility, key components in fall prevention. Evidence supports fall prevention in mid-life and older ages. Workstation models target specific balance strategies, while creating structure and individualization. Multimodal/multisystem approaches address prevalence of balance, primarily balance that is associated with natural aging.</td>
</tr>
<tr>
<td>Pilot study (2004) objective was to test the efficacy of specific balance-strategy training program for preventing falls among older adults. Following the pilot, researchers examined the efficacy of the program in various populations, including midlife, and special (health) populations. Current research and programming, does not have a focus target group. Primary, secondary, and tertiary prevention.</td>
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INTRODUCTION

The idea that a balance strategy training program could be beneficial across the mid-life period is supported by seminal findings within the literature (Low Choy, 2008; Low Choy, Brauer & Nitz, 2007; Isles, Choy, Steer & Nitz, 2004; Low Choy, Isles, Barker & Nitz, 2003; Nitz, 2003). A significant early decline in postural stability, functional balance, and more specifically, tasks requiring medio-lateral stability (e.g., sit to walk performance tasks), has been identified for ages 40 to 60 (Isles, Low Choy, Steer, & Nitz, 2004; Illing, Low Choy, Nitz, & Nolan, 2010), with further significant reductions in balance noted over 60 years of age (Fu, 2011). Strength and sensory system (e.g., vision, vestibular and proprioception) changes accompany this decline in balance ability for many of these individuals (Fu, 2011). Sensory challenges and strengthening exercises are required elements of prevention intervention programs that aim to preserve optimal balance and functional performances (Fu, Choy & Nitz, 2009).

Further support for targeting the menopausal period (women ages 40–58) for preventive interventions comes from the body of research that has been undertaken during this phase of life. It has been suggested that the loss of estrogen, which occurs in relation to menopause, may be associated with loss of balance (Birge, McEwen & Wise, 2001; Hammar, Lindgren, Berg, Moller & Niklasson, 1996). The menopause transition has also been shown to contribute to a phase where aerobic fitness, muscle strength and bone mineral density tend to decrease (Asikainen, Kukkonen-Harjula & Milunpalo, 2004).

To date, a limited number of studies addressing balance and postural stability decline, and prospective fall prevention intervention for individuals ages 40–60, have
been reported (Fu, Choy & Nitz, 2009). A need for prevention strategies – pre-emptive intervention directed toward middle-age where falls risk is likely to increase over time – has been identified by the program implementers and researchers of the Balance Strategy Training Program, with particular emphasis placed on the need for early identification of the next generation of individuals at risk of falls. As the segment of the population aged 65 years and over continues to rise, the resulting economic, fiscal, health and social impacts associated with this demographic shift necessitates the development and implementation of strategies that aim to prevent chronic diseases and falls (as well as their costly complications) (Fu, 2011).

**BACKGROUND**

Targeted interventions should ideally be offered to individuals who show changes and/or specific impairments in postural stability to slow deterioration and to minimize falls risk that will escalate with age. There is sufficient evidence to demonstrate that mid-life adults should be encouraged to keep active and to perform exercises that challenge their motor and sensory systems (Westlake, Wu & Culham, 2007; Shumway-Cook, Gruber, Baldwin & Liao, 1997; Lord, Caplan & Ward, 1993), and yet limited research exists on the implementation of fall prevention programming that includes a balance strategy focus for this target group.

In recent years, recommendations have been made to develop and implement such programming for adults across the mid-life period (Fu, 2011). These programs would aim to offset the development of detrimental changes that may contribute to falls in later years.
(Fu, 2011). The introduction of an evidence-based program that targets multiple elements of balance may help to prevent or reverse the detrimental balance decline associated with age and the ensuing falls (Fu et al., 2009).

**History and Development**

The *Balance Strategy Training Program* was first established during a pilot study by Drs. Nitz and Low Choy (2004), at the Department of Physiotherapy at the University of Queensland. Drs. Nitz and Low Choy wanted to test the efficacy of specific balance-strategy training program for preventing falls among older adults. Previous methods for fall prevention, such as strength training, flexibility and tai chi, have been proven effective. Up until their pilot study, no previous studies have investigated the efficacy of a *specific* balance strategy-training program presented through a workstation or circuit program (Nitz & Low Choy, 2004). In their approach, each workstation was designed to focus on a specific task that was required for balance, including, functional strength, flexibility, balance strategy practice, sensory integration, attention, and multi-tasking. Additionally, each workstation could be accommodated to various levels of ability. As the task becomes manageable, the level of difficulty can be augmented to increase the challenge. Participants of the pilot were assessed before the intervention and at a 3-month follow-up. Short-term results indicated participants in the balance strategy program did better than the control group, showing improvement in functional motor ability. Long-term results indicated both groups benefited from the interventions with a significant reduction in falls.
Dr. Stephanie Fu, colleague of Drs. Nitz and Low Choy further expanded on the *Balance Strategy Training Program* in her doctoral thesis. In her thesis, Dr. Fu developed a targeted balance strategy training program for healthy, less active women, ages 40 to 60 years (Fu, 2011). This program – referred to as the *Specific Balance Strategy Training (SBST) Program* – was administered\(^7\) between the years of 2004 and 2006, and the SBST Program aimed to improve balance and mobility, sensory system function and reaction times, as well as strength and flexibility, to delay the age-related decline in balance that has been linked to less active women in the community (Fu, 2011).

The researchers hypothesized that a targeted balance strategy training program would be *as* effective in improving balance and mobility, functional strength, ankle flexibility and joint position sense, as other more vigorous forms of exercise (Fu et al., 2009). Early implementation of such a program might help women to adopt a more active lifestyle in efforts to preserve their balance ability through a change in lifestyle (Fu et al., 2009).

It was thought that the SBST Program might also provide an evidence base that demonstrated the efficacy of a balance strategy training program for improved performance on balance and mobility tasks, *and/or* improved strength and somatosensory function in women 40 to 60 years of age (Fu et al., 2009). Moreover, these results might help to determine whether early balance training has a protective effect on the decline in postural stability that commonly occurs across the menopausal transition (Fu et al., 2009).

\(^7\) The administration of the SBST Program includes the recruitment, initial assessment, intervention, reassessment and follow-up reassessment phases.
A pre-emptive intervention to reverse or control these changes could help to improve balance among program participants, ultimately assisting in the prevention of unintentional injury due to falls (Fu et al., 2009).

**Specific Balance Strategy Training (SBST) Program Components**

A suitable comprehensive physical activity program can be created using the components of exercise programs that have been shown to have beneficial effects on the detrimental aspects of the menopause transition (Fu, 2011). Such a program would likely include a combination of impact activities; compressive loading; multidirectional tasks and working at the limits of stability; activation and progressive challenge to the somatosensory and vestibular system; functional strength training; and, flexibility and cardiovascular exercises (Fu, 2011).

The prescription of exercise for women across the menopause transition, whether for rehabilitation, health benefits and/or pre-emptive intervention for early falls prevention, should be performed by a knowledgeable health and fitness professional (Fu, 2011). To this end, a physiotherapist would be well-suited to work with this group of women, as the physiotherapist has a holistic understanding of multiple body systems, as well as an understanding of the physiological consequences of menopause and aging (Fu, 2011). A physiotherapist also has the ability to work within the limitations of a participant’s pre-existing co-morbidities or injuries and thus the capacity to adapt delivery to suit the needs of the participant (Fu, 2011).
Balance Training in Other Populations

Since the pilot of the Balance Strategy Training Program, researchers have studied the efficacy of the program in various populations. Long-term benefits have been effective among women during menopause between the ages of 40–60 years old (Fu, Low Choy, & Nitz, 2009). Pre-menopausal and menopausal women have shown to have reductions in somatosensory function (Low Choy, Brauer, & Nitz, 2007), flexibility (Nitz, & Low Chow, 2004), and loss of estrogen, which can be associated with loss of balance (Birge, McEwen, & Wise, 2001; Hammar, Lundgren, Berg, Moller, & Niklasson, 1996; Birge, 1998). More recent research has shown the efficacy of the balance strategy program in patients with myasthenia gravis, an autoimmune disease affecting neuromuscular transmission (Wong, Nitz, Williams, & Brauer, 2014).

Currently, the program is being implemented in community programs around south-east Queensland, as the ISAFE program, Innovative Strategies to Assist Falling Elderly. Additionally, the program is being used in Victoria, Australia by the Health Service Research Unit at Monash University, under the lead of Dr. Anna Barker.

Consumers

The initial pilot for the Balance Strategy Training Program was targeted towards individuals over the age of 60 years old, who had fallen at some point within the previous year (Nitz & Low Choy, 2004). Further inclusion criteria included participants who lived independently in the community and did not have an unstable cardiac condition.

Following the pilot project, the Balance Strategy Training Program was tested and implemented with women between 40 and 60 years of age who take minimum exercise or
are sedentary. Women were excluded who reported a history of falling within the past year. Furthermore, women were excluded if they had been diagnosed with neurological disorders, dizziness, major musculoskeletal dysfunction, and/or were taking medication for psychiatric disorders.

Dr. Nitz describes that her and her colleague’s recent work targets any woman over 40 years of age to enhance capacity to participate in everyday life activities, even though the research has focused on women with osteopenia and those who are sedentary. Dr. Nitz believes that all individuals are at risk of developing some form of illness if not undertaking some type of exercise. Essentially, the program does not believe in a target focus group. When conducting trials, Dr. Nitz explains that targeting or promoting a strategy as specifically “falls-prevention” inhibits participation as many individuals in mid-life feel they are “too young for falls prevention”. The overall goal of the Balance Strategy Training Program is to promote exercise and training to target multiple risk factors associated with aging and falls/fractures.

The Balance Strategy Training Program has been researched and implemented in various populations, including males and females; various ages, including mid-life and elders; and with various health conditions, including menopause and myasthenia gravis. The program has significantly shown to reverse the balance decline associated with aging, and leads to a more active lifestyle, with a reduction in falls.

**Levels of Prevention**

The Balance Strategy Training Program can be identified as preventing injury from a primary, secondary, and tertiary approach.
The Centers for Disease and Control Prevention (CDC) describes primary prevention as an act designed to prevent a disease, condition and/or injury from occurring in the first place. The *Balance Strategy Training Program* educates participants about slip, trip and fall risk. Additionally, the program educates participants about the advantages of exercise in the prevention of osteoporosis, arthritis and other age-related illnesses. It has been shown that adults as young as 40 years old show changes in sensory and motor systems, impacting balance, and thus risk of falls. The goal of the *Balance Strategy Training Program* is to prevent injury before it occurs by controlling balance decline that is significant between the ages of 40 to 60. Dr. Nitz believes that it is difficult to study incidence of falls in the younger age generation, as there are few, and it is difficult to look at immediate reduction. Fall prevention should begin at mid-life to prevent injury that is common due to age-related changes.

Secondary prevention is described as an attempt to identify a disease, condition and/or injury at its earliest stage so that prompt and appropriate management can be initiated. Successful secondary prevention reduces the impact of the disease/injury. The *Balance Strategy Training Program* was initially piloted on participants who had previously reported a fall within the last year and had some form of injury, such as a bruise or fracture, ultimately needing medical attention as a result, The researchers were able to study the efficacy of the program on re-injury and indicated that with the balance program, participants had a significantly lower rate of fall injury. The greatest advantage of the *Balance Strategy Training Program* is that it is adaptable and multi-dimensional to any individual, thus can easily be applied to an individual pre- and post-injury.
Tertiary prevention focuses on reducing and/or minimizing the consequences of disease, illness, and/or injury once it has been developed. The goal of tertiary prevention is to eliminate, or delay the onset of complications and disability due to disease. The *Balance Strategy Training Program* has been applied to patients with neurological and autoimmune diseases and/or illnesses. Wong et al. (2014) examined the efficacy of the Balance program on patients with myasthenia gravis (MG), an autoimmune disease affecting neuromuscular transmission. MG patients often report fatigue, ocular symptoms, and weakness in axial, bulbar, and limb muscles, resulting in reduced balance and function ability. The researchers demonstrated that the balance program significantly improves balance and strength in patients with MG. It could be suggested that improvements in balance and strength have the potential to reduce risk and injury related to MG complications.

**Stakeholders**

The Balance Strategy Training Program involves several stakeholders from a range of disciplines and organizations. In academic environments, the program is supported and implemented by physiotherapists in their curriculums. Physiotherapist students are involved in training and implementing the program in their practice. Additionally, the balance program has been researched, and continues to be part of clinical trial interventions throughout several research teams across Australia.

Clinically, the balance program has been supported by the Australian Physiotherapy Association. Currently, all physiotherapists at the University of Queensland, Australian Catholic University, University of Sydney, and Melbourne...
University include the *Balance Strategy Training Program* as part of their approach to fall prevention and balance improvement.

The *Balance Strategy Training Program* is also implemented with community agencies. As part of the *Innovative Strategies to Assist Falling Elderly* (ISAFE) program, balance training is provided to individuals through their Home and Community Care package that is government funding.

**RESOURCES**

*The Pilot Project*

The *Balance Strategy Training Program* first came to exist through a pilot project by Drs. Nitz and Low Choy at the University of Queensland (Nitz & Low Choy, 2004). The objective of the pilot was to examine the efficacy of a specific balance strategy-training program presented through workstations. Each workstation was designed to address specific aspects requiring balance, including strength, flexibility, balance strategy practice, sensory integration and attention. Furthermore, each workstation had the option to increase difficulty in order to accommodate individual strengths.

The specific tasks at workstations were developed from clinical experience and directed to address the sensory and/or motor deficits identified at assessment. As a result, many of the workstations have a number of targets, for example, vestibular integration and sensory challenge with surface manipulation.

Participants of the pilot were recruited through advertisements sent to medical practitioners, older adults groups, and physiotherapists. Participants had to be over 60
years of age and to have fallen at some time within the previous year. After inclusion criteria were met, 73 subjects were part of the pilot project.

All participants received an education booklet that provided information on reducing the risk of falls, as well as a calendar in order to track their slips, trips and falls. Participants were randomly assigned to either the balance strategy group (n=37) or control group (n=36). Participants attended 10 sessions of 1-hour duration at weekly intervals. A physiotherapist and a physiotherapist student carried out both interventions.

At the end of the pilot, 45 subjects completed the training (24 balance, 21 control). Participants were assessed before the intervention and at a 3-month follow-up. Short-term results indicated participants in the balance strategy program did better than the control group, showing improvement in functional motor ability. Long term results indicated both groups benefited from the interventions with a significant reduction in falls.

The initial pilot project demonstrated several important factors for reducing falls. First, workstations offer different exercise applications that are multi-dimensional, adaptable, and of various levels of difficulty; secondly, that the delivery of a specific balance strategy training approach significantly reduces falls and improves functional motor ability.

Following the pilot project, the balance strategy program has been implemented, evaluated, and shown to be an effective intervention with various other populations, i.e., mid-life men and women, and special (health) populations. These studies are reviewed in the Outcome section of this chapter.
Funding

The pilot project for the Balance Strategy Training Program was completed through governmental grants, including the Dorothy Hopkins Award for clinical physiotherapy research. Follow-up research was completed under grants provided by the Australasian Menopause Society. The University of Queensland and other funders provided initial funding to test the efficacy of the program.

Currently, the program is no longer funded by any source. The program is non-financially supported through physiotherapists, the Australian Physiotherapy Association, and fellow research colleagues.

Specific Balance Strategy Training (SBST) Program Funding

Financial support for this research was provided by the Queensland Branch of the Australian Physiotherapy Association in conjunction with the Dorothy Hopkins Award, University of Queensland Physiotherapy Alumni, and Department of Health and Aging Australian Commonwealth Government (Fu, 2011).

Several DAART Mater Health Services colleagues provided ongoing support for this project, with specific acknowledgements to Margaret Tweeddale; Virginia Caithness; University of Queensland colleagues, Venerina Johnson and Rosemary Isles; and, other research participants who gave of their time to participate in this research (Fu, 2011).

Dissemination of Program Information

The Balance Strategy Training Program has been implemented in many clinical practices of physiotherapists for fall and injury prevention. Many physiotherapists have
incorporated the balance program as part of their curriculum in educating clients about the risk of slips, trips, and falls, and how to prevent them through improving balance.

The Australian Physiotherapy Association has supported the *Balance Strategy Training Program* by introducing the program to members in gerontology and neurology.

**IMPLEMENTATION**

The *Balance Strategy Training Program* can be applied in a group or individual setting. During a group/class setting, participants practice exercises under the supervision of one or more physiotherapist(s). In a class setting, participants are taught the exercises and encouraged to practice on their own as they maneuver from workstation to workstation. In a class setting, workstations are in close proximity of each other, which allows for peer support, discussion and enjoyment. It is recommended classes have a maximum of six (6) participants. A disadvantage of completing the exercises in a class setting is that participants are limited in the difficulty level. Due to safety concerns, participants are not challenged to perform at their limit of stability, which is a requirement for improvement in balance performance.

During individual training, participants work one-on-one with a physiotherapist to gain the necessary skills. They are encouraged to take control of their individual program given an array of exercise stations suited to their individual problems identified at assessment. They are guided to increase degree of challenge and repetitions as appropriate to capacity to perform the task accurately. A major advantage of the workstation training method is that participants are encouraged to learn the exercises and
be able to apply them on a daily basis, independently. As a result self-efficacy is practiced and participants take control of their balance training program. Not only can individuals practice their exercises confidently outside of the exercise setting, but they become more aware of slips, trips, and falls.

Training of Physiotherapists

The Balance Strategy Training Program is facilitated by registered physiotherapists, and final year student physiotherapists. Currently, all physiotherapists at the University of Queensland, Australian Catholic University, University of Sydney, and Melbourne University include the Balance Strategy Training Program as part of their approach to falls prevention and balance improvement in their curriculum.

The Program Exercises

The Balance Strategy Training Program consists of 11 activities, plus stretching. The program is referred to as a workstation delivery model, where each workstation is designed to focus on a specific task, including strength and flexibility training, cardiovascular training, exercises that load trunk and lower limb muscles and challenge postural control. Furthermore, some of the activities include adding surfaces and visual challenges to promote attention and multi-tasking. Each workstation is designed to accommodate various levels of ability. As the task becomes manageable for the participant, the level of difficulty can be intensified to increase the challenge. For the specifications of each activity, refer to Appendix A & B.
Before and after completing the activities, participants are asked to stretch in order to prevent injury; including, legs, shoulders, neck and triceps.

**Challenges to Implementation**

The initial challenge in implementing the *Balance Strategy Training Program* was its novel approach to falls prevention—balance training—which differs from the usual resistance training approaches that are in current practice. Previous research supported strength-based, flexibility and tai chi methods of fall prevention. No other study or program implemented specific balance training through workstation methods. At the time, the most common and effective program was the Otago Program, a fall prevention program for older adults. Otago Exercise Program is a home based, individually tailored, strength training regime (Otago Exercise Programme, 2003).

**Current Implementation**

The *Balance Strategy Training Program* is currently being implemented in several programs throughout Australia. Many physiotherapists (both in academic and clinical settings) apply the program to their curriculum. Clinical physiotherapists use the *Balance Strategy Training Program* in rehabilitation settings both as a one-on-one intervention and as a group intervention. The program has been used for post-joint replacement, injury related to falls and non-falls, and neurological conditions.

Additionally, the *Balance Strategy Training Program* is implemented in community programming around south-east Queensland as the *Innovative Strategies to Assist Falling Elderly* (ISAFE) program. The name differs from the original program due
to a government funded program that utilized the *Balance Strategy Training Program* as the intervention for falls prevention. Currently, there is research being conducted on the ISAFE intervention which examines the efficacy of frequency of the intervention (twice weekly vs. once weekly). ISAFE can be accessed through an individual’s Home and Community Care package that is government funded and meant to enable them to live independently in their homes safely.

In an academic setting, the *Balance Strategy Training Program* is being used in Victoria, Australia by the Health Service Research Unit at Monash University, led by Dr. Anna Barker and her falls research team.

**Specific Balance Strategy Training (SBST) Program**

The rationale for the SBST Program is rooted in the demonstrated efficacy of other related programming found to reduce falls in persons over 60 years of age, and in women with osteoporosis, aged 40–80 years (Hourigan, Nitz, Brauer, O’Neill, Wong & Richardson, 2008). The SBST Program designed for the current study includes functional strength training and flexibility exercises, as well as exercises for postural control and tasks that challenge medio-lateral stability. More specifically, these tasks challenge participants’ stability when using ankle, hip, stepping and suspension strategies, while also testing their speed and reaction times (Fu, 2011).

The SBST Program itself is task oriented, drawing from a variety of daily, regular activities (Fu, 2011). Participants progress through program tasks—carried out at workstations—by adding dual and multiple tasks, as well as surface and visual challenges. The program tasks include trunk and lower limb strength, endurance training,
flexibility, control at the limits of stability, and control over narrower and unstable bases (Fu, 2011).

At the workstations, participants’ somatosensory function is targeted through surface challenges and the narrowing and destabilizing of base of support. Musculoskeletal challenge is also provided to participants through these exercises (Fu, 2011).

**Exercise Groups/Classes**

The exercise groups were run at the Neurological Aging and Balance clinic in the University of Queensland’s Physiotherapy Division. This location provided easy access for program researchers (e.g., University of Queensland staff) and for program participants, who lived in the community and were able to access the clinic via multiple transport options, including buses and other forms of public transportation (Fu, 2011).

Program participants were offered four different times for their exercise classes. After participants selected a time that best suited them, smaller groups—with a maximum of ten participants belonging to each group—were created (Fu, 2011). Researchers intentionally provided participants with several different class times in the hope that attendance would be maximized at each class (Fu, 2011).

During the intervention phase, participants in the SBST intervention group were required to attend two one-hour exercise classes for a period of 12 weeks. All participants (including those in the control groups) were required to attend four test sessions, which took place before and after the intervention (at nine and 24 month follow-up times).
Three class instructors—trained physiotherapists—received four hours of training on class content to ensure consistency across classes. Instructors were also provided with a sample video of an intervention class to serve as a visual example of how to conduct the exercise classes (Fu, 2011).

The exercise classes involved several activities, including a warm-up with stretching period (15 minutes); a period of workstation training (20 minutes); a period in which exercises were performed together as a group—with fitness ball—and floor exercises and toning exercises for further core stability (20 minutes); and, a cool-down relaxation and stretching period (5 minutes) (Fu, 2011). The exercise program was delivered using workstations that aim to target the multiple elements of balance that are integral to efficient balance and mobility (Fu, 2011).

The Workstations Model

Fifteen (15) workstations comprised the main content of the classes. Each workstation featured a specific task and/or activity addressing core balance and strengthening functions, including balance strategy practice; flexibility; sensory integration; functional strength activities; and, endurance training (Fu, 2011). Two other critical functions addressed at the workstations were fast stepping/fast movements under surface and narrow base challenge (functions that influence a person’s ability to counteract fears or anxieties that precipitate falling) (Fu, 2011).

The workstations were deliberately placed in close proximity to one another to facilitate social interaction and discussion, and to encourage enjoyment among the participants (Fu, 2011). The workstations were individualized to accommodate differing
levels of ability between participants, and to enable a progression in exercise load in individual participants (Fu, 2011). Participants were encouraged to control their own program and progress (under training and guidance from their instructors), which helped to foster feelings of self-efficacy among the participants (Fu, 2011). Workstations were thus structured in such a way as to offer a multi-dimensional and adaptable platform for program participants (Fu, 2011).

Taken together, the design of this workstation model promotes the integration of all elements of balance, as balance and mobility can be identified and easily transferred to functional, everyday activities within the home. It is primarily for this reason that the model might be readily accepted by women than more conventional exercise programs, which are generally only available in gym settings (Fu, 2011).

The Workstation Exercises

During each session, the course instructor/supervising physiotherapist discussed the rationale for each exercise presented, and provided ways to adapt the exercise to meet the needs of each participant (i.e. her lifestyle). By adapting the exercises to each participant, the instructors sought to facilitate seamless integration of the SBST Program into everyday life (Fu, 2011). As one might expect, participants were encouraged to continue practising these exercises following completion of the 12 week/24 session intervention (Fu, 2011).
Figure 1: Diversity of work station tasks

(Fu, 2011)
OUTCOME

The Pilot Program

The *Balance Strategy Training Program* was originally piloted to determine whether a specific balance strategy training program delivered in a workstation format was superior to a community-based exercise class program for reducing falls (Nitz & Low Choy, 2004). Each workstation was designed to focus on a specific task that addressed balance, including: functional strength, flexibility, balance practice, sensory integration, and added attention to demands during multi-tasking. The initial pilot described previously focused on participants whose age was at the end of the mid life spectrum, lived independently, and had fallen within the previous year. Participants were randomly assigned to the balance group (*n* = 37) or the control group (*n* = 36), and were followed up with 3 months post intervention.

Participants and Methodology

All participants in the balance group (intervention) and control group received an education booklet that provided information on how to reduce falls in the home or community and a calendar (for tracking slips, trips, and falls). Balance group participants attended 10 sessions of 1-hour duration on a weekly basis. The intervention included 8 workstations, with the first six activities focusing on specific tasks, while the last two focused participants working together to incorporate fun, social interaction, and competition. The control group included a warm up activity, and various “non-specific” activities (i.e., marching back and forth, lifting the arms above the head, and hip extensions).
Results

Results indicated that both the balance group and the control group benefited from the intervention with a significant reduction in falls, however, the balance group did better than the control group in various individual measures. Functional ability, as measured by Clinical Outcomes Variable Scale (COVS) items showed that the balance group had a significant response compared with the control group, who had no change in functional ability on COVS items. The balance group had significant changes in the clinical balance measure, including lateral reach, step test, TUG (timed “up and go”), TUGmanual, and TUGcognitive, compared with the control group who only showed improvements on TUG and TUGcognitive measurements.

The initial pilot offered an insight into the importance of creating specific task workstations to improve balance and reduce the number of falls. The researchers found that workstations offer the advantages of different exercise activities that are multidimensional and adaptable to participant’s functional motor ability level. Additionally, each workstation offered a level of task challenge and self-efficacy.

Specific Balance Strategy Training (SBST) Program (Fu, 2011)

Changes observed in the Specific Balance Strategy Training (SBST) Program were compared with changes in the control group, across similar time periods (Fu, 2011). At post-intervention, a satisfaction survey was administered to program participants in the SBST intervention, with researchers addressing issues ranging from attendance compliance to lifestyle change. Surveys were also administered to this group at appropriate follow-up periods (e.g., nine-month interval).
In addition to the satisfaction survey, the Short Form (SF)-36 Quality of Life Survey\(^8\) was completed at baseline and follow-up periods of nine-months and 24-months (Fu, 2011).

**Measurements**

The clinical measures of balance, strength, flexibility, cardiovascular fitness and somatosensory function were selected for inclusion in this study. These measures, previously validated and proven reliable within the research literature (Fu, 2011), have been shown to decline significantly within the 40–60 age group. Some of these measures—particularly those that support balance ability—tend to demonstrate a further significant decline within the 60–70 age group (Fu, 2011). Groups of these clinical measures (tests) were administered during the course of this study.

**Clinical Measures**

Eight clinical measures and two laboratory measures were used to measure balance/postural stability and mobility (Fu, 2011). With respect to the clinical measures, slightly different aspects of postural control were represented by each measure. These measures are Functional Reach; Lateral Reach with right and left hands; The Functional Step Test with right and left foot; Timed Up and Go (TUG) Test; Timed Up and Go Cognitive Test; Rapid Stepping Test (RST); Timed Tandem Walk; Static Tandem Stance; and Eyes Open and Closed (right forward and left foot forward) (Fu, 2011). A brief description of each clinical measure is provided in Appendix C.

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\(^8\) A participant (patient)-reported survey of participant health. Its 36 questions yield an eight-scale health profile and summary measures of health-related quality of life.
The laboratory measures of postural stability were measured by recording velocity of sway. A Neurocom Balance Master™ was used to run two laboratory tests (Fu, 2011). Three 10 seconds experimental trials were performed for each task of the two tests. The average velocity of sway was measured and recorded by the software program.

**Evaluation Results**

Following the intervention, the SBST intervention group showed significant improvement in multiple clinical balance measures, tactile acuity, ankle flexibility and strength of quadriceps and some hip muscles (Fu, 2011). In comparison, the control group only improved step test performances and tactile acuity of right foot (Fu, 2011). The improvements reported for the intervention group were maintained at later follow-up assessments (Fu, 2011).

Between the nine and 24-month follow-up period, cardiovascular endurance was also shown to improve significantly for the SBST intervention group (Fu, 2011). Weight loss across the assessment periods was sustained within the SBST intervention group, while the control groups were shown to gradually gain weight during this time (Fu, 2011).

Interestingly, the results of this study do not provide support for the hypothesis that “active” women perform better than “sedentary” women on balance and strength measures (Fu, 2011). The results demonstrate that active women, ages 40 to 60 years, who participate in a moderate to high level of physical activity (e.g., vigorous walking and keep-fit exercise for 150 minutes or more weekly), do not have superior balance ability or lower limb strength when compared to sedentary women (Fu, 2011).

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9 A dual force plate system that incorporates a PC and software, and estimates the centre of mass sway angle.
Large gym classes and cardiovascular activities (e.g., cycling, running and walking) have minimum effect on lower limb strength, static balance or functional balance tasks (Fu, 2011). Importantly, these results indicate that more targeted training for women ages 40–60 is required to improve balance and specific leg muscle strength to achieve a desired impact on risk factors for falls (i.e., to prevent unintentional injury due to falls from a primary prevention standpoint) (Fu, 2011). In a follow-up study Fu (2011) went on to provide support for the need for specific balance strategy training exercise program by showing it to be effective in improving balance and mobility, as well as in significantly increasing ankle flexibility and muscle strength.

From a public policy standpoint, this project generates support for a workstation circuit model, where each workstation targets an aspect of balance that can be changed by increasing the level of challenge (associated with a task) as a participant improves. In this delivery model, increasing the height of a step so that a participant’s own body weight can be lifted and lowered through a greater range attains functional strengthening. Put differently, the speed of motor response demand can be increased and cognitive and/or motor tasks that require attention sharing can be added to facilitate enhanced system efficiency and to improve a participant’s ability to respond to functional need (Fu, 2011).

The benefits of the delivery model were reported by the participants through the satisfaction survey and reassessments (Fu, 2011). For example, the proximity of the workstation delivery model to the home/work site was cited an important consideration for program developers to factor into their delivery system(s) (Fu, 2011). The researchers of this study speculate that the participants may have been empowered by the structure of the programming (particularly its individualized approach and focus on building self-
efficacy and meaningful, transferable knowledge), as they continued to engage in more physical activities following the completion of the program (Fu, 2011).

The results of this study also shed new light on how best to use a multimodal/multi-system approach to pre-emptively address the prevalence of balance problems that are encountered with aging (Fu, 2011). A falls prevention program that targets multiple systems that underpin balance might include a screening initiative and education and intervention modules, among other items.

The implementation of a balance screening program is a recommended first step in the development and roll-out of targeted, prevention programming, which accurately identifies a mid-life woman’s falls risk and ultimately prevents unintentional injury due to falls. Once the relevant risk factors are selected and tested, this low-cost screening initiative would enable at-risk women and (perhaps men) to be referred for a diagnostic assessment to determine whether or not they might benefit from pre-emptive education and intervention efforts (Fu, 2011). A functional weight-bearing program of exercises would follow the assessment, providing participants with an opportunity to increase their balance mobility and sensorimotor skills.

An Evidence Based Program Across Populations

The Balance Strategy Training Program using a multimodal/multi-system has been identified as an evidence-based program that enhances balance and functional mobility in adults in mid-life and in the elderly. Moreover, a recent study (Wong et al., 2014) has found that the Balance Strategy Training Program is effective in improving balance for individuals with myasthenia gravis (MG), an autoimmune disease affecting
neuromuscular transmission. MG patients often show symptoms in reduced balance, strength, fitness, and overall functional abilities. There has been little research that has examined the effects of different exercises to treat and alleviate symptoms in patients with MG, however, Wong and his colleagues found that a specific balance training program is effective in improving balance and quantitative myasthenia gravis score (QMG).

The *Balance Strategy Training Program* has been found to be beneficial for increasing balance, strength and overall functional ability in various populations, including mid-life, the elderly, osteopenic individuals, menopausal women and individuals with neuromuscular disorders. It is no wonder why it is an exemplary program as it highlights the importance of balance in reducing slips, trips and falls. After all, balance is a complex skill that requires the interaction of sensorimotor processes while stability and mobility are undertaken.
The Balance Strategy Training program addresses all aspects of sensory-motor decline that contribute to loss of balance ability in individual’s ages 40 to 60 years. Program implementers hypothesized that a targeted balance strategy training program would be as effective in improving functional strength, ankle flexibility, joint position sense, and balance and mobility, as other more vigorous forms of exercise (Fu et al., 2009). It was thought that the implementation of the Specific Balance Strategy Training (SBST) program might help women to adopt a more active lifestyle, which would in turn help to preserve their balance ability (Fu et al., 2009).

The program provides support for the development of a functional weight-bearing program of exercises (e.g., sensorimotor training to target multiple aspects of sensory system function and muscle strength) to be incorporated into a strategy for healthier aging and falls prevention. The results also demonstrate the efficacy of a balance strategy training program for improved performance on balance and mobility tasks, and improved strength and somatosensory function in individuals 40 to 60 years (Fu et al., 2009). The balance strategy training program used is as effective as other common exercise programs in improving various aspects relating to balance and mobility (Fu, 2011). Moreover, the program has led to the adoption of a more active lifestyle for less active participants, in mid-life.

The design and delivery of this program have proven effective in reducing the risk of falls across mid-life and older ages. To this end, the evaluations can be used to guide the development of a multimodal/multi-system strategy and approach to address the prevalence of sensorimotor contributors to balance decline in middle and older ages.
REFERENCES


Activity One – Walking Station

Participants are asked to walk forwards, backwards, and side-to-side. Lunges are then incorporated. To increase difficulty, participants are asked to add challenges by carrying unstable objects (i.e., ball on a tray), or bouncing/tossing a ball up in the air while performing the stepping activities.

Activity Two – Reaching and Balance Activities

Participants are asked to pick up objects from a low position, turn, step and reach to a place up high. To increase difficulty, participants are asked to change size of base of support and move to a soft surface.

Activity Three – Theraball Exercises – Seated

Participants are asked to sit on an exercise ball with their back straight and arms by their sides. Then participants slowly rock their pelvis back and forth, and then side-to-side. The goal is to concentrate on maintaining good posture and balance. To increase difficulty, participants are asked to lift each leg up and down and then sideways. An additional challenge can be added by increasing the dynamic component (i.e., bounce and maintain control).

Activity Four – Steps up and Down

Participants are asked to step up and over a raised platform, forwards, backwards and sideways. If participants are unsteady, they may use a wall for support. To increase difficulty, participants are asked to increase the height of the step or add more speed.
**Activity Five – Target Stepping**

Participants are asked to step to targets sideways. Participants then progress to jumping to target and then hopping to target. To increase difficulty, participants are asked to pick up objects past target and drop on next target. To add an additional challenge, participants can increase the size of steps, as larger steps have more benefit.

**Activity Six – Wall Balance Exercises**

Participants are asked to stand with their back to a wall and lean back, roll onto their heels, allowing their toes to lift off the floor and arms to swing forward. To increase difficulty, participants are asked to keep their balance without touching the wall. Next, participants are asked to do the exercise with their eyes closed. To further increase difficulty, participants are asked to place an exercise ball against the wall and do push-ups on the ball.

**Activity Seven – Obstacle Course**

Participants are asked to complete activities that challenge ability to walk or step over obstacles. This can include picking up small items from the floor while bending at hips and knees, and keeping back straight. To increase difficulty, participants are asked to pick up items under larger items (i.e., cards under a ping pong table).

**Activity Eight – Mat Exercises – Cat Stretch**

Participants are asked to practice cat stretches on a floor mat. Ensuring both hands are placed directly in line with shoulders and knees directly under hips, while exhaling, roll down chin and arch back up. While inhaling, relax your back down and look in front.
Activity Nine – Mat Exercises – Side Lying

Participants are asked to lay on a floor mat sideways and slowly lift both legs off the ground while pelvis is straight. Next, participants are asked to leave underneath leg on ground in a bent position, while lifting the top leg up to ceiling, followed by lifting underneath knee and foot pointing forwards. (Repeat on other side.)

Activity 10 – May Exercises – Prone

Participants are asked to lay on a floor mat on their stomach and lift each arm and leg separately making sure not to twist trunk, while holding this position. Next, participants are asked to do the same while on their hand and knees (in a cat position).

Activity 11 – Theraball Exercise – Lying Supine

Participants are asked to lay on their back on a floor mat, with an exercise ball underneath their legs, arms flat on the mat. Next, participants are asked to raise themselves and hold the position. To increase difficulty, participants are asked to do the same, but their arms must be reached towards the ceiling.
APPENDIX B

This booklet describes a number of activities that are designed to improve your balance, postural stability and bone loading to maintain or improve bone mineral density. All the activities contribute in some way to achieve these outcomes.

The combined benefit of improved balance and prevention of osteoporosis is designed to reduce the likelihood of falling and sustaining a fracture as a result of a fall.

Each activity described in the booklet focuses on different aspects of balance and bone loading. Different levels of intensity are provided to allow for different physical abilities or advancement of the program. All people applying this booklet to guide their exercise program should commence at the lowest level and be vigilant regarding progress of each activity, as it is important to prevent injury, as well as to gain maximum benefit.

Progression to higher challenge levels should only occur when you can perform the lower levels efficiently and easily.

Remember – nothing should hurt! If it does stop and consult your Physiotherapist.

This publication was developed by Dr J Khy, Senior Lecturer in Physiotherapy, and produced by the UQ Health and Rehabilitation Clinics Unit.
MORE STRETCHES

Shoulders

Neck

Gentle stretching of muscles before and after exercising helps to prevent injury. When stretching, slowly lengthen the muscle and never bounce or force past a comfortable position. You should hold each stretch for 15-20 seconds.

Hold on to a window sill or chair back to steady yourself.

Do not hold the neck with the head tilted or looking up if you have any arthritis in your neck joints or hardening or the arteries as this can be dangerous.

PREVENTATIVE HEALTH

Balance strategy training

An exercise program which targets multiple risk factors associated with falls and fractures

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STRETCHES

Hold on to a window-sill or chair back to steady yourself.

Activity 1:
WALKING STATION

- Keep your tummy tucked in and stand tall.
- Walk heel to toe forwards and back.
- Sideways walk.
- Step giant steps with a lunge, forwards and back.
- Slip forwards and backwards.
- Cross right leg in front then behind as you walk sideways. (Grapevine stepping)
- Add additional challenges by carrying an unstable object eg a ball on a tray, or bouncing or tossing a ball up in the air while performing the stepping activities.

Activity 2:
REACHING AND BALANCE ACTIVITIES

Pick up objects from a low position, turn, step and reach to a place up high. At all times gently pulling navel in towards spine, while keeping your back straight. Challenge is increased by changing size of base of support and to a soft surface.

Activity 11:
THERABALL EXERCISES

Lying Supine

- Lying on your back, place one leg on the ball and the other on the floor beside the ball, with your arms by your side. Slowly extend as you bridge up and lift your bottom off the floor. Inhale when lowering.
- Count to five as you raise yourself up, then hold for five seconds, then count to five as you lower. Repeat this 10 times. Increase the number of sets to a maximum of five.

- Following this, have both legs on the ball and your arms by your side when you bridge up.
- Next, increase the difficulty by repeating the same exercise but raise your arms towards the ceiling.
- Concentrate on your breathing at all times, and make sure your pelvis does not move from side to side.

- Remember to go in all different directions and include turns.
Activity 10: MAT EXERCISES
Prone

- Lying on your stomach, lift each arm and leg separately, making sure you do not twist your trunk to lift higher.
- Lift up slowly, hold for five seconds and then slowly lower. Always keep your hip bones touching the ground when lifting your legs. Then lift opposite arm and leg together without twisting your trunk to lift.
- Then on your hands and knees, try the same. Concentrate on exhaling when lifting your arm/leg, and inhale as you lower your arm/leg.
- When on your hands and knees, draw in your abdomen as you lift.
- Remember to not lift your arms/legs past the horizontal, e.g. Don’t twist your trunk.

Activity 3: THERABALL EXERCISES - SEATED

- Sit on ball with back straight and arms by your sides. Make sure you are breathing slowly.
- Slowly rock your pelvis forwards and backwards. Repeat in groups of 20 repetitions.
- Slowly rock pelvis from side to side — x 20
- Slowly rotate pelvis to the right, then to the left in a circle — x 20
- Always keep your back straight and head upright.
- Concentrate on maintaining good posture.
- Progress by lifting each leg up and down then out side-ways.
- Keep your back straight and as still as possible.

Activity 4: STEPS UP AND DOWN

- Step up and over in the forwards, sideways and backwards directions. If you are unsteady, do this near a wall or window sill for support if needed.

- Again, if you feel safely set-up, you can increase the height of the step or add more speed to this exercise.

- Using the bottom step of a flight of steps is OK.

Activity 9: MAT EXERCISES
Side Lying

- Lie on your side with your legs straight and in line with your body. Lift both legs slightly off the ground until your pelvis is straight.

- Leave your underneath leg on the ground in a bent position while lifting the top leg up to the ceiling. Lift the top leg up keeping your knee and foot pointing straight in front.

- Lift the underneath leg knee and foot pointing forwards.

- Always keep the moving leg in line with your trunk.

- Concentrate on drawing your naval in towards your spine, breathing normally as you lift and lower your leg.
Activity 8: MAT EXERCISE
Crawling Position (Cat Stretch)

- Firstly, ensure that your hands are placed directly in line with your shoulders, and your knees directly under your hips. While inhaling, roll your shin down and arch your back up towards the ceiling.

- While inhaling, slowly relax your back down and look up in front of you.

- You can relax back into sitting on your haunches; feel a lovely stretch through your back and shoulders.

Activity 5: TARGET STEPPING

- Step right foot to targets on right side of box then swap to left foot to step to targets on the left of the box.
- Progress to stepping both feet to target.
- Finally jump to target and then try hopping to target and back to the box.
- Pick up an object past target and drop on next consecutively round the box.
- Progressively increase the size of the steps in all directions—larger steps have more benefit.

Activity 6: WALL BALANCE EXERCISES

- Stand with your back to a wall and lean back, roll onto your heels allowing your toes to lift off the floor and your arms to swing forward.
- Try keeping your balance without actually touching the wall for support.
- Next try this exercise with your eyes closed.
- Turn to face the wall and do wall push-ups — 10 repetitions.
- Placing your TheraBall against the wall and doing push-ups on the ball will increase balance challenge.

Activity 7: OBSTACLE COURSES

- Activities that challenge ability to walk or step over obstacles should be practiced.
- Include bending down to pick up small items from the floor, but ensure that you bend at your hips and knees and keep your back straight to reach.
- Breathe normally throughout this exercise.
Clinical Measures (Fu, 2011)

Functional Reach measures reaching forward from a bilateral stance position to the limits of stability. This measure was chosen for its excellent inter- and intra-rater reliability, concurrent validity and use as an accurate predictor of falls in frequent fallers.

Functional Reach is a good indicator for anterior/posterior postural stability and balance in normal, healthy females, ages 41–69.

Lateral Reach with right and left hands measures reaching sideways from a bilateral stance position to the limits of stability. This measure has high test-retest repeatability.

The Functional Step Test with right and left foot measures speed of performing a dynamic standing task, with the number of repeated steps on and off a block counted. This test has high test-retest reliability and concurrent validity with functional reach, gait velocity and stride length.

A significant decline in step test performance has been documented in healthy women, ages 40–50.

Rapid Stepping Test (RST) measures the time taken to make 24 random steps—as quickly as possible—under the tester’s command. This test has been used to assess fall risk based on the ability of stepping responses, as stepping is often used as a strategy to maintain stance in near fall situations.

A participant’s ability to take a maximal step and return to his/her initial position is a good predictor of mobility performance, frequent falls, self-reported disability, and fear of falling.

Timed Up and Go (TUG) Test measures the time taken to stand up from a chair; walk three metres (as quickly and safely as possible past a line on the floor); turn around; walk back to the chair; and, sit down with one’s back against the chair.

This test has excellent inter- and intra-rater reliability and concurrent validity. It is also a predictor of falls in frequent fallers.

A participant’s balance, functional ability and gait speed is measured by the TUG Test.
Timed Up and Go Cognitive Test measures the time taken to complete the TUG Test, while the subject counts backward by three from a randomly selected number between 80 and 100.

The ability of the participant to share attention between the motor tasks of the TUG Test and a relatively complex cognitive task is evaluated within this test.

Timed Tandem Walk measures the time taken to complete 10 tandem steps (walking heel-toe) forwards, backwards, and then with eyes open and closed, forwards and backwards.

Static Tandem Stance Eyes Open and Closed (right forward and left foot forward) determines the participant’s ability to stand under conditions of reduced base of support and sensory input.
Walk With Ease (United States)

by Georgios Fthenos

Population Served: Mid-life

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<table>
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<th>Background</th>
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<tr>
<td>The Arthritis Foundation Walk With Ease Program is a multi-component program that is centred on walking and includes health education, stretching and strengthening exercises, and motivational strategies.</td>
<td>The Walk With Ease Program is promoted nationally through the Arthritis Foundation’s web site and ongoing media placements.</td>
<td>Walk With Ease has four key components to Walk With Ease: (1) walking; (2) health information; (3) exercises; and (4) motivational strategies.</td>
<td>Walk With Ease’s information and strategies are based on research, existing programs, behaviour change and arthritis management.</td>
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<td>The Walk With Ease Program is a community-based physical activity and self-management education program. People can take part in the program by using the Walk With Ease workbook on their own, or in groups that are led by qualified leaders.</td>
<td>Any host agencies offering the group classes should provide: (1) an accessible site; (2) a safe and accessible place to walk; (3) adequate general liability insurance; and (4) a signed program co-sponsorship form, documenting their understanding of their responsibilities.</td>
<td>Individuals using the workbook on their own are encouraged to walk at least three times a week and to utilize all of the resources in the workbook over a six-week period.</td>
<td>Evaluation of the program by the Thurston Arthritis Research Center and the Institute on Aging at the University of North Carolina the program has shown increases in balance, strength and walking pace, as well as pain reduction for participants, following completion of the program.</td>
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<td>The individual and group sessions are structured as six-week programs.</td>
<td>The Arthritis Foundation’s participant release form provides protection if someone is injured. This protection is designed to minimize risk.</td>
<td>Groups meet three times a week for six weeks, for a total of 18 sessions. The recommended class size is 12–15 participants per leader.</td>
<td>Walk With Ease has been found to decrease disability and improve arthritis symptoms, self-efficacy, and perceived control, balance, as well as strength and walking pace in individuals with arthritis, regardless of format (individual or group)</td>
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<td>Group sessions include a 10 to 35 minute walking period, socialization time, pre-walk informational lecturrettles, warm up and cool downs.</td>
<td>The Arthritis Foundation will provide a Walk With Ease leader certification.</td>
<td>Some benefits are maintained one year following program participation, particularly among the self-directed learners.</td>
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INTRODUCTION

Progress is starting to be made in documenting some of the issues associated with falls in mid-life (Stevens, Corso, Finkelstein & Miller, 2006; Rubenstein & Josephson, 2006). With the link between older and elderly adults and falls established, researchers have extended their work to populations of mid-life adults and considered whether falls are commonly experienced within this group. Recent research suggests that falls and fall injuries are common among mid-life adults (Talbot, Musiol, Witham & Metter, 2005), with poor neuromuscular function (i.e., gait speed and balance) serving as a significant risk factor for mid-life adults.

Poor neuromuscular function is quite common in people who have arthritis (Rubenstein & Josephson, 2006). The prevalence of arthritis in the United States (U.S.) is highest amongst mid-life adults (ages 45–64 years) and older adults (ages ≥65 years) (Center for Disease Control and Prevention, 2013). Moreover, arthritis is the most common cause of disability in the U.S. (Center for Disease Control and Prevention, 2009).

In recent years, the Center for Disease Control and Prevention (CDC) examined the prevalence of falls amongst mid-life and older adults with arthritis in different states and territories in the U.S. More specifically, data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) was analyzed to assess the state-specific prevalence of having fallen and having experienced a fall injury in the past 12 months for adults ages ≥45 years (with and without doctor-diagnosed arthritis). The CDC reported that the prevalence of one fall, two or more falls, and fall injuries in the past 12 months was significantly higher amongst adults with arthritis, when compared to those without
arthrits, for all 50 states and the District of Columbia. Clearly, the prevalence of falls and fall injuries is high amongst mid-life adults with arthritis. It seems likely that this issue can be adequately addressed through greater dissemination of arthritis management materials and fall prevention programs in both clinical and community practice.

Public health approaches to the prevention of falls amongst older adults have typically focused on modifying fall risk factors (e.g., muscle weakness in the legs; gait and balance problems; psychoactive medication use; poor vision; environmental hazards, such as slippery surfaces or tripping hazards) and identifying and treating the symptoms of chronic conditions (e.g., arthritis) that increase fall risk. To date, public health approaches to preventing poor outcomes amongst adults with arthritis have tended to focus on evidence-based self-management education and physical activity interventions that have been shown to reduce pain and improve function by correcting muscle weakness and balance dysfunction.

In sum, efforts to combine arthritis exercise programs with proven fall prevention interventions might reduce the risk of falls in the at-risk population of people with arthritis. Effective fall prevention interventions can be multifaceted, however, the most effective single strategy involves exercise or physical therapy that serves to improve gait, balance, and lower body strength (Gillespie, Roberston & Gillespie et al., 2009).
DID YOU KNOW?

Compared to adults without arthritis, adults with arthritis are more than twice as likely to report two or more falls or an injury related to a fall.

- Centre for Disease Control and Prevention

A Centre for Disease Control and Prevention study of adults 45 years and older shows that adults with arthritis were more likely to fall and have a fall injury compared with adults that did not have arthritis. For this study, a fall injury was defined as a fall causing a person to limit regular activities for at least one day or go see a doctor. Older adults (ages 65 and older) and middle-aged adults (ages 45 and older) with arthritis had a greater chance of falling or having a fall injury.

Source: Barbour et al., 2012
BACKGROUND

The evidence-based Arthritis Foundation Walk With Ease Program is a community-based physical activity and self-management education program. The program can be completed individually, with participants using the Walk With Ease workbook on their own, or in groups, with participants working with trained leaders to use the workbook. Both the individual and group formats are structured as six-week programs.

A multi-component program, Walk With Ease centres on walking (its central activity) and includes health education, stretching and strengthening exercises, and motivational strategies. Group sessions include a 10–35 minute walking period, socialization time, pre-walk informational lectureettes, warm up and cool downs. The primary goals of Walk With Ease are threefold: (1) to promote education about successful physical activity for people with arthritis; (2) to promote education about arthritis self-management and walking safely and comfortably; and, (3) to encourage participants to continue their walking program and to explore other exercise and self-management programs that deliver proven benefits for people with arthritis.

Individuals using the program’s workbook on their own are encouraged to work towards walking at least three times a week and to utilize all of the resources in the workbook over a six-week period. Individuals using the workbook in groups meet three times a week for six weeks (a total of 18 sessions). The recommended class size is 12 to 15 participants per leader, with some groups having more than one leader, as required. The average class session length may last for 45 minutes in the beginning weeks and increase to 60 minutes or more as the group participants improve their fitness level. The
standardized scripts for group sessions suggest that time spent walking increases 5 minutes or so each week, as the participant capability allows. The physical capability of the group and the amount of time spent socializing before and after classes does influence the average class session length and amount of time spent walking.

By the end of the six-week program period, participants achieve several aims, including: understanding the basics about arthritis and the relationship between arthritis, exercise, and pain; learning how to exercise safely and comfortably; using methods to make walking fun; making a practical personal walking plan with realistic goals for improved fitness; gathering tips, strategies and resources to help them overcome barriers and continue to be physically active; and learning about other programs and resources that can help maintain walking and other physical activity.

Walk With Ease is a licensed program of the Arthritis Foundation and a Center for CDC- approved intervention.

RESOURCES

Promotion of the Walk with Ease Program

The Arthritis Foundation Walk With Ease Program is promoted nationally through the Arthritis Foundation’s web site and through ongoing media placements, including articles about the program appearing in 2010 volumes of *Arthritis Today* and *Family Circle*. A marketing brochure is available from the Arthritis Foundation National Office to assist Arthritis Foundation field offices and their partners in promoting the program. A media kit with a sample news release is also available for promotional purposes. The media kit was originally produced as part of the program’s Implementation
Guide, with a fact sheet on this information included in the Leader’s Guide. The brochure, media kit and fact sheet are also included on the Program CD.

Arthritis Foundation field offices and program partners who work to develop their own promotional materials are both required to include the full program name and the new program logo within their materials. If the offices and/or partners are marketing to a mixed audience, including people with conditions other than arthritis, the title “Walk With Ease” may be used, along with a subtitle like “An Arthritis Foundation Program”. Alternatively, the Arthritis Foundation logo may be used on the same page or within the same context.

Figure 1. Walk With Ease Program Advertisements

Source: Arthritis Foundation
Program Costs

The program costs are dependent upon the number of classes offered and the number of leaders trained. Some of the typical costs to start up the program are listed as follows:

Cost to train leaders (can choose to offer online OR in-person workshop OR both):

- On-line training workshop—Registration Fee $50, including materials
- In-person training workshop expenses:
  - Meeting room rental, LCD projector rental, refreshments (if not provided by site);
  - Trainer travel/ honorarium (if appropriate);
  - Set of materials for trainer: Walk With Ease Trainer’s Guide and Program CD $6.95 plus shipping and handling;
  - Set of materials for each trainee: Walk With Ease Leader’s Guide and Posters $15.14 plus shipping and handling;
  - Optional materials to provide to each host agency: Program CD $1.99; and, Implementation Guide $4.53 plus shipping and handling.
- Participant/class costs:
  - Walk With Ease participant workbooks: $5 each—chapter cost plus shipping and handling;
  - Each group leader needs a Leader’s Guide and set of posters (provided after training);
  - Optional costs for group classes: any leader honorarium/fees, facility fees, refreshments and incentive items.
• General costs:

  • Staff member (amount of time dependent on scope of program) to coordinate recruiting and managing partners, training logistics, and collaborating with partner sites on leader recruitment, kickoff events or other promotional activities, as well as class logistics and data.

**Figure 2. Walk With Ease Program Materials**

![Walk With Ease Program Materials](source: Arthritis Foundation)

**Facility Requirements**

Any host agencies offering group classes should provide several items, including:

1. an accessible site for the program that is consistent with the *Americans with Disabilities Act*, as well as any reasonable accommodation that may be necessary to ensure that the program is accessible to people with disabilities;
2. a safe and accessible place to walk inside (e.g., indoor track, gymnasium, mall) or outside (e.g., neighborhood,
walking trail); (3) adequate general liability insurance (industry standard is $1 million); and, (4) a signed program co-sponsorship form that documents a shared understanding of responsibilities.

**Injury and Liability**

The Arthritis Foundation’s participant release form provides protection should a participant experience an injury (Figure 3). This protection is designed to minimize risk for the Arthritis Foundation, the agencies that have signed the program co-sponsorship agreement, and the trained leaders. Any agencies hosting the Walk With Ease group classes are expected to sign the program co-sponsorship agreement, which indicates that they have adequate liability insurance.

**Walking Environment**

The training workshops for leaders include a session on how to provide a safe walking environment. Leaders are also encouraged to obtain basic first aid training (*see below for more information on leader requirements*).
Program Leaders

When recruiting individuals to undergo the Walk With Ease leader training, it is important for recruiters to find leaders that have certification in cardiopulmonary resuscitation (CPR). As mentioned, first aid certification is strongly recommended for leaders, given the danger of falls or other injuries (particularly when the program is conducted outdoors). Recruiters also consider other desirable trainer abilities, including: (1) empathy towards people with arthritis and related diseases (that has been gained through personal or professional experience); (2) interest in working with groups of people with arthritis and related diseases; (3) experience in teaching physical activity classes and skill in group process and instructional techniques; (4) desire and ability to
help others; and, (5) a strong belief in the value of regular physical activity.

Two options exist for leader training. The first option is a 3 to 4 hour, in-person training workshop, and the second is an online training module. Applicants need to contact the Arthritis Foundation to obtain access information for the latter option.

At the completion of leader training, the Arthritis Foundation provides Walk With Ease leader certification. Certification as an Arthritis Foundation Walk With Ease Program Leader requires successful completion of an Arthritis Foundation Walk With Ease Program Leader Training Workshop (online or in-person), and instruction of at least one six-week Arthritis Foundation Walk With Ease Program class series within six months of completing the Leader Training Workshop. Additionally, leaders must teach at least one class series annually and submit their participant data to the Arthritis Foundation. Leaders remain certified as long as they continue to teach at least one class series per year.

**IMPLEMENTATION**

As mentioned, the four key program components to Walk With Ease are walking, health information, exercises, and motivational strategies.

*Walking*

The Walk With Ease program encourages a walking duration of 10 to 35 minutes. Walking is one of the safest and most beneficial forms of exercise for most people with arthritis, as well as for people with other chronic health conditions.
Health Education Information

All participants receive the Walk With Ease workbook—a workbook that is organized in a logical sequence to provide the information needed for participants to get ready to walk, to begin walking, and to stay motivated and continue walking. Both the workbook and the corresponding lecturettes conducted during the group sessions provide basic information on arthritis, managing pain and stiffness, self-monitoring for physical problems, strategies on what to do when exercise hurts, and how to anticipate and overcome barriers to being physically active, including various tips on proper clothing and equipment for exercising.

Stretching and Strengthening Exercises

Both the individual and group participants are encouraged to perform stretching exercises when they walk and strengthening exercises, twice a week. The Walk With Ease workbook includes directions for stretching and strengthening exercises (see Appendix A for Walk With Ease Exercises) and participants can access video demonstrations of these exercises on the Arthritis Foundation’s “Let’s Move Together” website (www.letsmovetogther.org).

Motivational Strategies and Tools

The Walk With Ease workbook includes self-tests, a six week contract and walking diary forms to help participants to identify their needs and interests, and to set goals and rewards, and track their progress. Each workbook chapter also contains motivational tips. These tools inform the group classes.
An online support component is also available to individual and group participants. Several resources are provided on The Arthritis Foundation’s “Let’s Move Together” website (http://www.letsmovetogether.org), including: (1) a Movement Tracker to track amount of time spent walking; (2) copies of the self-tests and motivational worksheets in the Walk With Ease workbook; (3) video instruction for the stretching and strengthening exercises; (4) ability to build actual or virtual teams; (5) a message board where participants can share their experiences; and, (6) positive feedback through automated emails when participants reach established milestones (Figure 4).

**Figure 4. Walk With Ease Program Participant Resources**

Source: Arthritis Foundation
OUTCOME

The Thurston Arthritis Research Center and Institute on Aging at the University of North Carolina, in evaluating Walk With Ease, assessed the effects of the 6-week program delivered in both instructor-led and self-directed formats. To provide some context for the evaluation, the observational pre-post study design brought forward 462 individuals with self-reported arthritis that participated in either the group format (n = 192) or the self-directed format (n = 270).

Participants

To be eligible to participate, prospective participants had to report joint pain, stiffness, or any type of doctor-diagnosed arthritis; be age greater than 18 years of age without a serious medical condition; be able to speak English; have no cognitive impairments. Upon enrollment in the program, participants selected either the instructor-led format or the self-directed format of the 6-week program. Group participants were led by an instructor and met three times a week for one hour, while self-directed participants followed the program on their own (with guidance from the Walk With Ease workbook). All participants completed self-report and performance-based assessments at baseline and at the end of the 6-week program. Participants also completed self-report assessments one year after completion of the program; no performance-based assessments were conducted at this time.

All methods used within this program were approved by the University of North Carolina at Chapel Hill Biomedical Institutional Review Board.
Pre- and Post-Intervention Assessments

Baseline assessments took place between June to September, 2008, and were performed at community sites for up to one week prior to the start of classes. Group and self-directed participants attended the assessments and provided informed consent, completed a self-report questionnaire (paper or computer based), and underwent a series of performance-based tests administered by a trained research team member. All participants received a Walk With Ease workbook at the time of the baseline assessment.

Group classes began within one week of the baseline assessments, and self-directed participants were able to begin the program immediately following the baseline assessments. The 6-week follow-up assessments were conducted at each site between August and November, 2008. At the time of the follow-up assessment, participants completed the performance-based physical function tests, the self-report survey, and a written satisfaction survey composed of closed and open-ended questions about their experience in the program. One year after completing the program, group and self-directed participants were mailed follow-up surveys (self-reported outcomes, only) that served to assess the long-term effect of the program.

Primary Outcome Measures

Primary outcomes used to assess the program included physical function (performance-based and self-report) and arthritis symptoms (pain, fatigue, stiffness). These outcomes were obtained through physical performance tests and self-reported measures. Physical performance tests were completed on the same day as the self-reported tests, with participants completing five performance-based physical function
measures. These are timed chair stands, timed 360° turn test, single-leg stance, walking speed test, and the 2-minute step test.

Timed chair stands: the timed chair stands assess lower extremity strength. Participants sit in a standardized armless chair with their backs against the chair and arms folded across their chests. The participant stands up and sits back down as quickly as possible once, and then three times in a row without stopping. There was one trial for each of the chair stands. The test was measured in seconds.

Turn tests: the 360 degree turn test measures turning ability and balance. Participants stand with arms at their sides and feet comfortably apart, then turn in a full circle to the right, and then in a full circle to the left. There were two trials for each direction and the times (in seconds) were averaged.

Single-leg stance: this test measures balance. Participants stand next to a chair, wall, or raised surface, and stand on one leg, and then the other, while placing their arms across their chests. There was one trial on each leg. This test was measured in seconds, with the number of seconds of balance up to a maximum of 30 seconds measured.

Walking speed: this test measures functional mobility. Participants walk a premeasured 20-foot distance on flat ground, with six-foot acceleration and deceleration zones at each end. This is performed at both a normal and a fast walking pace. There were two trials for each pace, and the times (in seconds) to complete the distance were averaged. The average speed was calculated in units
of meters.

2-minute step test: this test measures aerobic endurance. Participants march in place for two minutes, taking as many steps as possible in that time and raising both knees to a predetermined height (based on the height of the participant). The predetermined height was marked on the wall next to them. There was one trial for this test.

Evidence-Based Results

A total of 462 participants enrolled in the program and entered self-report data at baseline. A majority (n = 270, 58.4%) of the participants opted for the self-directed format and the remainder (n = 192, 41.6%) opted for the group format. Follow-up rates at 6 weeks were 83.3% and 92.7% for self-directed and group participants, respectively.

Significant adjusted mean improvements were seen at six weeks for nearly all self-report and performance measures in both formats. Modest to moderate effect sizes were seen for disability, pain, fatigue, stiffness, and helplessness. The performance measures of strength, balance, and walking pace all showed modest to moderate improvements. No adverse events were reported for either format.

The Walk With Ease program demonstrated a decrease in disability and an improvement in arthritis symptoms, self-efficacy and perceived control, balance, strength, and walking pace in individuals with self-reported arthritis, regardless of whether they chose the group class or self-directed option.

Although self-directed and group participants maintained some benefits at the one-year follow-up mark, self-directed participants were more likely to continue walking
and retained improvements in more self-reported physical function, symptoms, and psychosocial outcomes. Future research is needed in this area to determine whether there are successful motivational strategies to transition group format participants (and mid-life adults who have arthritis and are less healthy) into a continued independent walking lifestyle, producing ongoing benefits comparable to those experienced by the self-directed participants.

These results have been replicated within other studies (Nyrop et al., 2011; Schoster et al., 2011; Bruno et al., 2006) (Figure 5), a fact which serves to confirm that the Walk With Ease program is effective in reducing falls amongst mid-life adults with arthritis.

**Figure 5. Evaluation Studies at a Glance**

<table>
<thead>
<tr>
<th>Author</th>
<th>Design</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group Format</strong></td>
<td></td>
<td></td>
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<tr>
<td>Bruno, et al. 2006</td>
<td>Quasi-experimental, repeated measures, retested at six months (n=163)</td>
<td>Increased self-efficacy, improved physical ability, decreased pain</td>
</tr>
<tr>
<td>* Callahan, et al. 2011</td>
<td>Quasi-experimental, controlled trial, pre-post test design (n=462)</td>
<td>Improved self efficacy, strength, perceived control, balance, and walking pace Significant decrease in pain for self-directed group</td>
</tr>
<tr>
<td>* Nyrop, et al. 2011</td>
<td>Quasi-experimental, pre-post test comparison (n=94)</td>
<td>Improved workplace limitations</td>
</tr>
<tr>
<td><strong>Self-directed</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Source: Arthritis Foundation
The Arthritis Foundation’s Walk With Ease Program is a safe, easy and inexpensive program for community-based falls prevention. The program is unique in that it offers group and self-directed options for participation, and expands traditionally offered opportunities for physical activity. This opportunity may allow more people to benefit from the program and incorporate walking into their lifestyles, given that some individuals may not enroll in group-based physical activity programs for reasons relating to busy schedules and a preference for individualized instruction.

Walk With Ease’s information and corresponding strategies are rooted in research and tested in exercise science, behaviour change, and arthritis management. Evaluated by the Thurston Arthritis Research Center and the Institute on Aging at the University of North Carolina, the program has been shown to increase balance, strength and walking pace, as well as to reduce pain for participants. All in all, Walk With Ease decreases disability and improves arthritis symptoms, self-efficacy, and perceived control, balance, strength, and walking pace in individuals with arthritis.

While Walk With Ease was originally directed towards people with arthritis, the program can also be beneficial for people without arthritis, and specifically, for mid-life adults. The program can also be adapted for use in older populations, using the self-directed and group-formats. The adaptability, low cost and proven success of the program make it ideal for replication in various contexts, globally, beginning with communities that would like to reduce their incidence of falls reported by their members.
REFERENCES

Arthritis Foundation. www.arthritis.org


APPENDIX A: WALK WITH EASE EXERCISES

Precautions
By each picture there are notes about precautions you should take.

Balance. Be careful to maintain your balance. Hold on to a stable object (e.g., a chair, railing, wall, or counter) while doing this exercise.

Joint surgery. If you have had recent joint surgery, then check with your doctor before doing this exercise.

Muscle cramps. Stop this exercise if it causes a muscle cramp.

Osteoporosis. If you have osteoporosis or a back compression fracture, then check with your doctor before doing this exercise.

Warm Up Before Stretching
Here are 2 suggestions for warming up:
1. walk slowly for 3 to 5 minutes
2. March in place for 3 to 5 minutes.

Marching in place
PRECAUTIONS: JOINT SURGERY, BALANCE
• Stand, holding on to a supportive railing or the back of a chair.
• Hold on to two chairs if you feel unsteady.
• Alternate lifting knees up and down as if marching in place.
• March in place for 3 to 5 minutes.
• Gradually try to lift knees higher and/or march faster toward the end.

For more information about Walk with Ease, go to www.letsmovetogther.org.

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Send requests to 1330 W. Peachtree St., NW, Suite 100, Atlanta, GA 30309.
Key Stretches To Do Before and After You Walk

Before you walk, stretch your calf muscles, your hamstrings, your hip flexors and quadriceps, and your iliotibial bands. If you have concerns about your balance, do the seated version of the exercises. Here are some additional hints about stretching:

• Stretch just until you feel tension, and then hold the stretch in that place.
• Stretch gently and smoothly, and do not bounce.
• Be sure to do each stretch on both right and left sides.
• Breathe naturally as you hold the stretches. Don’t hold your breath.

1. Stretch your calf muscles.
PRECAUTIONS: JOINER SURGERY, BALANCE

• Lean against a wall, tree, or chair for support.
• Place your right foot back and keep your toes facing forward.
• Slightly bend the knee of your left leg, never letting your knee go beyond your toes.
• Keep your head up and spine straight.
• Press the heel of your right foot into the ground.
• Hold and then repeat with your left leg.
2. Stretch Your Hamstrings – Standing

PRECAUTIONS: MUSCLE CRAMPS, BALANCE

- Holding onto a supportive railing or wall, place your right leg on a slightly raised surface, like a step or a curb.
- Keep your hips facing forward and your standing knee bent.
- Slowly bend your left knee until you feel a very mild tension or stretch on the back of your right thigh.
- To stretch a little more, bend your left knee a little at your hips, keeping your back straight.
- Hold and then repeat with your other leg.

Stretch Your Hamstrings – Seated (if concerned about your balance)

PRECAUTION: MUSCLE CRAMPS

- Sit on the edge of a bench, chair, or other low, firm surface.
- Stretch out your right leg with your toes pointing up, and place your hands on your left thigh.
- Keep your left foot flat on the ground.
- Keeping your back straight, gently lean forward from your hips until you feel a stretch in the back of your right thigh.
- Pull your foot back, pointing your toes up.
- You may feel a stretch by just straightening up your back.
- Hold and then repeat with your left leg.

For more information about Walk with Ease, go to www.letsmovetogether.org.
3. Stretch Your Hip Flexors and Quadriceps — Standing

**PRECAUTIONS:** JOINT SURGERY, BALANCE

- Step forward with your left foot, keeping your right knee bent.
- Tuck your buttocks tightly under your hips.
- You will feel a stretch on the front of your right hip and upper thigh.
- Hold and then repeat with your left leg.

**Seated (if concerned about your balance)**

**PRECAUTION:** JOINT SURGERY

- Sit on the side of a stable chair, bench, or other low firm surface.
- Gently move your right leg back and behind you.
- Tuck your buttocks tightly under your hips.
- You will feel a stretch on the front of your right hip and upper thigh.
- Slide to the opposite side of the chair.
- Repeat with your left leg.
4. Stretch your iliotibial bands (ITBs)
PRECAUTIONS: JOINT SURGERY, BALANCE
- Stand with your right hip less than foot from a wall.
- Cross your left leg in front, but don’t put weight on it, and use your right arm against the wall for support, keeping both knees slightly bent.
- Lean toward the wall with your right hip until you feel a stretch on the outside of your right hip.
- Turn around and repeat on the other side.

Additional Stretches You May Wish to Try
Bent leg calf stretch
PRECAUTIONS: JOINT SURGERY, BALANCE
- Lean against a wall, tree, or chair for support.
- Place your right foot back, keeping your toes facing forward.
- Slightly bend your left knee, never letting it go beyond your toes.
- Slightly bend your right knee, as well.
- Keep your head up and spine straight.
- Press the heel of the right foot into the ground.
- Hold and then repeat with the left leg.
Front of calf and toe stretch

PRECAUTIONS: JOINT SURGERY, BALANCE

• Lean against a wall, tree, or chair for support.
• Bend your left knee slightly; never letting it go beyond your toes.
• Put your right leg back with the toe pointing straight back.
• Keep your head up and spine straight.
• Gently press front of back foot and lower leg toward floor.
• Hold and then repeat with your left leg.

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Send requests to 1280 W. Peachtree St., NW, Suite 100, Atlanta, GA 30309
Strengthening Exercises for Walking

Do these exercises three times each week to help strengthen the muscles and joints you use when you walk. Start with 5 to 10 repetitions on each side; increase to no more than 30 repetitions. As for the stretching exercises, if you have concerns about your balance and a seated version is suggested here, do that one. If you have ongoing, severe pain in your knees, ankles, or hips, talk to your healthcare practitioner to get specific exercise recommendations. Here are some more hints:

- Be sure to do each exercise with both right and left sides.
- Go slowly, and do each movement with control.
- Breathe naturally. Don’t hold your breath!
- If you have increased pain that lasts for more than two hours after exercising, next time do fewer repetitions.

Standing back leg lift

PRECAUTIONS: JOINT SURGERY, BALANCE

- Hold on to a counter, table, railing, or wall for support.
- Stand straight and lift your right foot back (keeping your ankle bent) until only your right toes are on the floor, then bring your foot forward again.
- Keep your right leg straight as you move it back and forth.
- Stand straight and don’t lean forward, so the motion comes from your hip and you feel the muscles tightening in your buttocks.
- Return only your toes to the floor between repetitions.
- Repeat with your left foot.
- Repeat 5 times on each side to start, increasing to no more than 30 times on each side.
Heel and toe raises
Standing

PRECAUTIONS: JOINT SURGERY, BALANCE, MUSCLE CRAMPS

- Hold on to a counter, table, railing, or wall for support.
- Lift your toes, keeping your heels on the floor.
- Hold for a count of 5.
- Lower slowly.
- Lift your heels, keeping your toes on the floor.
- Hold for a count of 5.
- Lower slowly.
- Repeat 5 times to start, increasing to no more than 30 times.
- It is easier to do both legs at the same time. If your feet are too sore, then wear shoes or do this exercise while sitting down.

Seated (if concerned about your balance)

PRECAUTIONS: JOINT SURGERY, BALANCE, MUSCLE CRAMPS

- Sit down with or without your shoes on.
- Lift your toes, keeping your heels on the floor.
- Hold for a count of 5.
- Lower slowly.
- Lift your heels, keeping your toes on the floor.
- Hold for a count of 5.
- Lower slowly.
- Repeat 5 times to start, increasing to no more than 30 times.
- It is easier to do both legs at the same time.

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Joint surgery. If you have had recent joint surgery, then check with your doctor before doing this exercise.

Muscle cramps. Stop this exercise if it causes a muscle cramp.

Osteoporosis. If you have osteoporosis or a back compression fracture, then check with your doctor before doing this exercise.

Warm Up Before Stretching
Here are 2 suggestions for warming up:

1. Walk slowly for 3 to 5 minutes
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Marching in place
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- Stand, holding on to a supportive railing or the back of a chair.
- Hold on to two chairs if you feel unsteady.
- Alternate lifting knees up and down as if marching in place.
- March in place for 3 to 5 minutes.
- Gradually try to lift knees higher and/or march faster toward the end.

For more information about Walk with Ease, go to www.letsmovetogether.org.
“It’s a well-planned program with detailed resources and AF staff support. It’s an important program for companies looking to address arthritis and sedentary lifestyle among the population.”

-Partner Worksites

Get the Facts

Studies from 56 worksites that offered a wellness program of some type showed an average:

- 26% reduction in health care costs.
- 27% reduction in sick leave absenteeism.
- 32% reduction in workers’ compensation and disability management cost claims.

Awareness Through Movement

by Georgios Fthenos and Danielle Hryniewicz

Population Served: Mid-life

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<tr>
<td>Awareness Through Movement (ATM) works with people to expand their repertoire of movements, to enhance awareness, and to improve balance and balance confidence.</td>
<td>Human and financial resources for this project were provided by various sources, including the Delaware Valley Chapter of the National MS Society and Widener University (Physical Therapy Education). ATM classes were presented by James Stephens, the principal investigator of this program. Stephens was assisted by one or two other practitioners, who worked with participants to clarify the verbal descriptions of movement problems and to help the participants to develop movement strategy.</td>
<td>Four ATM classes (2 hours in duration) were held in the late morning/early afternoon, with a 1-hour break for lunch. The content of the classes was tailored to the neuromusculoskeletal status of each participant, with complexity ranging from participant to participant, and guidance and rest provided when needed. A primary goal of the process was to develop participant skill in using intrinsic feedback. Participants were encouraged to explore options for movement which were unfamiliar to them – and even difficult for them – and to select a form of movement that was comfortable and effective.</td>
<td>The researchers found significant improvements in balance and balance confidence as a result of the series of ATM classes provided to participants in the intervention group. The change observed suggests that further program of this type of intervention could be beneficial to people with MS and other disabling diseases. This program has been referenced and replicated in recent years. The effects of ATM programming in mid-life adults (who do not have disabling diseases) should be explored in future research, given that the current body of anecdotal evidence strongly suggests that there are beneficial effects for all adult participants of ATM.</td>
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<td>ATM is typically conducted in groups, with classes lasting from 30–60 minutes in duration. Participants begin each class by doing a movement that they are able to do and then work to slowly expand their control repertoire by exploring the kinesthetic dimensions of this movement. In this program, the researchers hypothesized that 10 weeks of ATM classes would produce improvements in balance performance, balance confidence, and self-efficacy amongst program participants with Multiple Sclerosis.</td>
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INTRODUCTION

In preventing fall injury resulting from balance control problems, researchers and program developers have explored Awareness Through Movement (ATM). Researchers have put forward case reports on the positive effects of ATM programming for mid-life adults, particularly in the areas of pain management (De Rosa & Porterfield, 1992), motor and postural control (Stephens et al., 2001), functional mobility (Batson & Deutsch, 2005), and psychological and quality of life effects (Kerr, MacDonald, Gordon & Stalker, 2002). To date, however, most of the available research on balance and falls identifies risk factors and interventions to prevent falling and to improve quality of life in older ages (Connors, Galea & Said, 2011; Hillier, Porter, Jackson & Petkov, 2010; Vrantsidis, Hill, Moore, Webb, Hunt & Dowson, 2009; Ullmann, Williams, Hussey, Durstine & McClenaghan, 2008; Stephens et al., 2001).

One of the risk factors identified within this research is fear of falling—a factor that limits the activity of older and elderly people (Stephens et al., 2001). Stephens et al. (2001) suggest that psychological factors related to fear of falling may also affect people with Multiple Sclerosis (MS), who tend to be considerably younger in age than older and elderly adults. Stephens et al. (2001) further suggests that fear of falling and low balance confidence may be important factors for the health and well-being of people with MS, who have been found to have significantly reduced activity levels. These activity levels are highly correlated with perceived health status (Stephens et al., 2001).

In addition to fear of falling and low balance confidence, balance disturbances in people with MS may result from dysfunction of any one (or combination) of the vestibular, visual and somatosensory systems (Stephens et al., 2001), and/or from the loss
of neuromuscular control (e.g., strength or coordination required to perform movements and control postural) (Stephens et al., 2001). Taken together, the high frequency and complexity of balance and postural control problems in people with MS have prompted researchers to address balance as an important component of primary and secondary prevention within this population (Stephens et al., 2001). The common theme amongst a variety of approaches to improve balance and postural control is the need to learn and to develop active control of the body’s centre of mass, particularly in tasks of increasing complexity that emphasize a range of environmental factors (Stephens, 2001).

**ATM programming for people with MS**

Several researchers have looked at the effects of ATM programming for mid-life adults with chronic, disabling diseases (e.g., MS) and for mid-life adults with identified balance and gait problems (Dennenberg & Reeves, 1995; Dean, Yuen & Barrows, 1997; Batson & Deutsch, 2005). In one study, participants with MS were randomly assigned to ATM (intervention) and control groups, with the ATM group demonstrating improvements in motor skill and well-being (Bost, Barges & Russell, 1994). Another study reported the effects of 16 weeks of ATM and Tai Chi\(^\text{10}\) with the ATM (intervention) group showing significant improvements in balance (Hall, Griddle & Ring, 1999).

In a pilot study of the effects of ATM programming in women with MS, three of the four participants reported large improvements in motion analysis (suggesting improved balance) and well-being (Stephens et al., 1999). One of these participants, who had reported multiple weekly falls before the intervention, reported no falls for eight weeks.

\(^\text{10}\) A Chinese system of slow meditative physical exercise designed for relaxation and balance and health.
months following the intervention (Stephens et al., 1999). All four participants from this study reported subjective improvements in balance and postural control (Stephens et al., 1999).

In sum, high frequency and early appearance of postural control symptoms in people with MS has led researchers to conclude that balance disturbances are one of the most disabling symptoms for those with MS (Stephens, DuShuttle, Hatcher, Shmunes, & Slaninka, 2001). Balance and postural control problems are reportedly common amongst mid-life adults, with important implications for people with MS.

BACKGROUND

History

“Awareness Through Movement” (ATM), a Feldenkrais style of teaching, was created several decades ago by Dr. Moshe Feldenkrais (Strauch, n.d.). It is based on a philosophy of movement, designed to improve function in activities of daily living and recreation by increasing awareness of movement habits (Strauch, n.d.).

Dr. Moshe Feldenkrais, an Israeli physicist, engineer, and active athlete/martial artist, began to train practitioners in ATM instruction in 1969. At the time of his death in 1984, he had trained approximately 300 practitioners, with the majority of them residing in the United States (US) (Strauch, n.d.).

In 1977, the Feldenkrais Guild was established to support and represent the practitioners that Feldenkrais had trained. The Guild assumed responsibility for ATM instruction by accrediting professional trainings, adopting a code of ethics and standards
of practice for practitioners, and by pursuing other related activities to promote effective standardization and evaluation of ATM teaching styles and programming (Strauch, n.d.).

The International Feldenkrais Federation (IFF) was established in 1992 to serve as a federation of practitioner organizations throughout the world. The IFF coordinates the organization of most Feldenkrais Guilds and Associations, as well as other key Feldenkrais professional organizations. The primary aim of the IFF is to develop the international Feldenkrais community by promoting effective communication, collaboration and cooperation in the spirit of Awareness Through Movement and Functional Integration (a style of teaching associated with the Feldenkrais Method) (Strauch, n.d.).

As in the case of the Guild, the IFF has adopted Standards of Practice, which give descriptions of the applications of teaching methods (Strauch, n.d.). While business is executed by the IFF’s Board of Directors and administrative staff, the General Assembly of the IFF (which meets annually in different countries) is responsible for making decisions (Strauch, n.d.).

Awareness Through Movement

Awareness Through Movement (ATM) is an educational system that assists in the development of a functional awareness of the self in the environment. The program works with participants to expand their repertoire of movements, to enhance awareness, and to improve balance and balance confidence (Strauch, n.d.).

The learning-based approach associated with ATM involves practitioners leading participants through an exploratory movement process that is facilitated by verbal
suggestion (Stephens et al., 2001). ATM is typically conducted in groups, with classes lasting from 30–60 minutes in duration. Each class is organized around a particular function to help participants become more aware of their habitual neuromuscular patterns and rigidities, and of new ways of moving. Awareness of one’s own patterns, rigidities and movements helps to increase sensitivity and to improve efficiency in these areas (Strauch, n.d.)

Participants begin each class by performing a movement that they are able to do and then working to slowly expand their control repertoire by exploring the kinesthetic dimensions of this movement (Stephens et al., 2001). This can be achieved through a hierarchy of tasks and across a variety of human and object environments. The challenge for the practitioner is to create a learning environment in which the individual capacity for learning, the challenge of the task and the constraints of the environment are matched for a positive, individualized learning outcome (Stephens et al., 2001). The goals and processes needed to improve balance and postural control are considered throughout ATM instruction (Stephens et al., 2001).

The overarching goal of ATM is to help people become self-directed learners through the specific use of sensimotor experiences and the exploratory processes of moving (Stephens et al., 2001).

ATM has also been found to assist pregnant women in improving their gait balance and is currently offered by way of custom-tailored classes and DVD instruction.
Current Project

The current project of balance performance, balance confidence and self-efficacy in people with MS is seminal to the body of research relating to ATM programming. Stephens et al. (2001), in this project, conduct research that is methodical, rigorous and rooted in the principles of scientific inquiry. This project has also been referenced and replicated in recent years by a number of researchers (Ullmann, 2008; Stephens, Pendergast, Roller & Weiskittel, 2005; Stephens, Cates, Jentes, Perich, Silverstein, Staab, du Shuttle, Hatcher, Shmunes & Slaninka, 2003).

The researchers in this project aim to test the subjective reports of improved balance. They hypothesize that 10 weeks of ATM classes will produce improvements in balance performance, balance confidence, and self-efficacy, amongst program participants who were part of the intervention group. This effect would be observed when participants in the intervention group were compared to those in the control group—a group involved only in social/educational classes (Stephens et al., 2001).

Project Design and Participants

Twelve (12) participants were recruited from local MS support groups, physician practices and the Delaware Valley Chapter of the National MS Society. There were two criteria for inclusion in this project: (1) diagnosis of definitive or probable MS; and, (2) ability to stand independently without an assistive device and to ambulate at least 100 feet with or without an assistive device (Stephens et al., 2001). Participants also needed to be medically stable and at least 18 years of age.
Potential participants were excluded from this project if they: (1) had an exacerbation within a month of the beginning of the project; (2) had surgery within three months of the beginning of the project; or (3) were involved in another project (Stephens et al., 2001).

The researchers of this program chose to work exclusively with people at an ambulatory level so that all people in the project would be able to participate in the ATM classes at a similar level. Participants were diagnosed with either relapsing-remitting\textsuperscript{11}, primary progressive\textsuperscript{12}, or secondary progressive\textsuperscript{13} forms of MS. The disease process was stable for all participants at the time of the project (Stephens et al., 2001).

All participants signed an informed consent form prior to entering the project, with approval for the project granted by the Widener University Committee for the Protection of Human Subjects (Stephens et al., 2001). Once the project was underway, participants kept a log of changes in medication, functional status and falls. This log was maintained by participants for the entire duration of the project.

**Participant Groups**

Participants were randomly assigned to the Awareness Through Movement (ATM) group (n=6) or the control (EDU) group (n=6). The EDU group participated in four 90 minute educational classes, presented by experts in the field. Topics included the use of acupuncture treatment, new medications available for treatment, benefits of exercise, and social support issues encountered in the process of dealing with MS (Stephens et al., 2001).

\textsuperscript{11} A form of MS in which patients have relapses of MS and periods of stability in between relapses.
\textsuperscript{12} A form of MS in which symptoms continually worsen from the time of a patient’s diagnosis.
\textsuperscript{13} A form of MS in which symptoms begin a steady march, without relapses or remissions.
Participants in the ATM group attended eight classes that ran 2 or 4 hours in length (for a total of 20 hours). The ATM classes covered a variety of topics relating to balance and mobility in lying down, sitting and standing activities.

Project Timeline

The project was conducted during a 10–week period from July through to September, 1999. All classes were conducted in air-conditioned classrooms at Widener University, Pennsylvania (United States) (Stephens et al., 2001).

RESOURCES

Human Resources

A number of personnel and volunteers contributed to this project, including the people with MS who volunteered and participated in the project; the Delaware Valley Chapter of the National MS Society and the Jimmie Heuga Center, who assisted in recruiting subjects; Widener University Physical Therapy research assistants, Andrea Nangle, Ken Kron, Lance Gardner and Mariana McSweeney; Practitioners, Hans Hartmann, C.J. Heald, Cheryl Hertzog, Evelyn Jacobs, Tim Fein, Sharon Duffy and Susan Giffen; Control Group Educators and Consultants, Alicia Conill, MD; Robert Sommerlatte (NeuroCom representative); Carol Lieper, PT, PhD; Richard Malamut, MD; Lorna Lee, acupuncturist; and, Lee Zaslow, PT, EdD; and, the Faculty of Widener University's Institute for Physical Therapy Education.
**Project Practitioners**

Awareness Through Movement classes were presented by James Stephens, the principal investigator of this project. Stephens was assisted during each class by one or two other practitioners, who worked individually with participants to clarify (when needed) the verbal descriptions of movement problems and to help participants to develop and to act on images of possible body organization and movement strategy (Stephens et al., 2001). Program assistants also shared alternative movement strategies with the rest of the group during each class. All six participants in the intervention group were presented with the same verbal instructions and guidance, at the same time (Stephens et al., 2001).

**Principal Investigator**

Dr. James Stephens is currently the Chair of the Feldenkrais Educational Foundation of the North America Research Committee and the Research Director of the Feldenkrais Guild of North America. He has conducted extensive research in the areas of balance, gait confidence, falls prevention and ATM programming, with an emphasis on special populations (e.g., people with Multiple Sclerosis).

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**IMPLEMENTATION**

**Awareness Through Movement Intervention**

The 2-hour Awareness Through Movement (ATM) classes were held in the morning. The 4-hour ATM classes spanned late morning and early afternoon, with a 1-
hour break for lunch. The content of the classes was tailored to the neuromusculoskeletal status of each participant, with complexity ranging from participant to participant, and guidance and rest provided when needed.

As previously mentioned, eight ATM classes were held over a period of 10 weeks. The classes presented were created uniquely for the intervention group in order to address individual needs; prerecorded classes were not used (Stephens et al., 2001).

Awareness Through Movement Classes

During the ATM classes, participants engaged in movements that were small and slow in nature (Stephens et al., 2001). Practitioners at the first ATM class presented some basic principles on sensing one’s base of support and awareness of effort, as well as his/her momentum and organization of body segments, as they affect balance. The first class also focused on the maintenance of normal, easy breathing, during movement. These principles were presented for both side-lying and sitting positions (Stephens et al., 2001).

Subsequent classes focused on developing participant awareness of the movements of rolling supine (lying face upward) to side-lying, rolling from supine to sitting, and moving from sitting to quadruped (on hands and knees) (Stephens et al., 2001). A number of these classes involved movements of weight shifting, pelvic tilting, turning one’s trunk while sitting in a chair, and standing from sitting in a chair. Turning, weight shifting, and weight bearing in standing were also explored as was walking forward and backward, and transferring movement from the floor to standing (Stephens et al, 2001).
Transitional forms for each of these movements were explored during the classes. Manual guidance was given, when necessary, to help participants find a more comfortable method of organizing their movements. It should be noted, however, that the use of manual guidance was minimal (Stephens et al., 2001).

**Individual Participant Goals**

A primary goal of the project was to assist participants in developing skill in using intrinsic feedback (Stephens et al., 2001). To this end, participants were encouraged to explore options for movement which were unfamiliar to them—and even difficult for them. From these options, participants were to select a form of movement that was both comfortable and effective (Stephens et al., 2001).

Participants were encouraged to experiment with class material on their own, in their everyday lives. At the start of each class, participants were asked to describe how they applied new ways of organizing their movement to the tasks of the previous week (Stephens et al., 2001).

**Class Environment**

All classes were audiotaped in full to preserve a record of the classes presented. The environmental conditions presented mostly a firm base of support (hard wood floors). Some movements were performed on foam mats (Stephens et al., 2001).
OUTCOME

It should be noted that demographic information and disease status information were collected prior to the intervention. Self-report methods and portions of the ‘Kurtzke assessment’\textsuperscript{14} were also used in the assessment of this project (Stephens et al., 2001).

**Effect of Intervention**

The results of this intervention reveal that significant improvements in balance and balance confidence were achieved as a result of the ATM classes (Stephens et al., 2001). As described, these classes incorporated the full range of basic principles suggested for balance training into a kinesthetically based, exploratory movement learning program (Stephens et al., 2001).

The results also indicate that a group motor learning process can be structured to produce positive changes across members of the group (Stephens et al., 2001). The change observed suggests that further consideration of the contribution that this type of intervention could make to the prevention of injury resulting from unintentional falls in people with MS, people with disabling diseases, and even general populations of mid-life adults, is warranted (Stephens et al., 2001).

**Ecological Theory of Motor Learning**

The researchers of this project draw possible explanations for the outcome from Kasser and Newell’s Ecological Theory of Motor Learning (1991) (Stephens et al.,

\textsuperscript{14} The Kurtzke Expanded Disability Status Scale is the standard method for evaluating neurological impairment in MS.
According to Kasser and Newell (1991), the Ecological Theory of Motor Learning is centred on the concept of a perceptual-motor workspace in which a learner searches for new solutions to motor problems. ATM programming provides an avenue for the learner to seek and discover solutions to their own motor problems, having identified these problems through the process of improving one’s body awareness.

The ATM intervention used in this program meets all of the balance training conditions suggested by this theory, as classes were focused on the development of kinesthetic awareness, an understanding of the movement strategies that participants used, and an exploration of strategies that might be used (Stephens et al., 2001). Consistent with Kasser and Newell’s theory (1991), ATM seems to be an effective learning process for people who have chronic disabilities and have become limited in their repertoire of movement strategies over a course of time (Stephens et al., 2001). ATM also has potential for helping mid-life and older adults to walk with “better quality”, as ATM practitioners suggest (Bervinchak, n.d.).

CONCLUSION

The researchers of this project have found significant improvements in balance and balance confidence as a result of a series of ATM classes. Through this project, the researchers have demonstrated that a group motor learning process can be structured to produce positive changes across members of a group. The changes observed suggest that further research on this topic and type of intervention could be beneficial for people with MS and other disabling diseases (Stephens et al., 2001), as well as for mid-life and older-aged adults who want to improve their balance and balance confidence. ATM
programming can assist in all levels of prevention—primary, secondary and tertiary—and offer adults, generally, with an opportunity to actively work towards preventing unintentional injury due to falls.

While the findings of the current project are specific to adults with MS, future research in this area should investigate the effects of such programming in mid-life adults (who do not have disabling diseases), particularly since the current body of anecdotal evidence strongly suggests that there are beneficial effects for all participants of ATM programming. At the present time, there is strong evidence to suggest that ATM provides strength, coordination and balance training to people who have MS; chronic orthopedic problems; chronic neurological deficits; and speech impediments (Stephens et al., 2001).
REFERENCES


Hall, S.E., Griddle, A., & Ring, A. (1999). Study of the effects of various forms of exercise on balance in older women. Healthway Starter Grant, Final Report #7672, Department of Rehabilitation and Aged Care, Sir Charles Gairdner Hospital, Nederlands Western Australia.


DIY Falls: Take Time Before You Climb (New Zealand)

by Georgios Fthenos

Population Served: Mid-life

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New Zealand self-reported injury data indicates that nearly a third of injuries occur within the home. 40,370 New Zealanders, ages 25 to 59 years, reportedly experienced a primary public hospital admission for an injury caused by an unintentional fall. 28% of these falls occurred at home. Males are four times more likely to fall from a building or structure, or from a ladder or scaffolding, than females. The DIY Falls program aims to reduce the incidence of ladder falls in the Waimakariri District (New Zealand).

As a WHO Safe Communities initiative, the program seeks to raise awareness of the issues surrounding ladder falls, and to affect behavioural change towards safe practice when working at heights.

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<td>New Zealand self-reported injury data indicates that nearly a third of injuries occur within the home.</td>
<td>This program aims to engage and inform with a comprehensive media campaign targeting both do-it-yourself (DIY) handymen/women, and their families.</td>
<td>The program is implemented using distinctive branding, case studies to personalize the campaign, staff training at local DIY outlets and stores, comprehensive media coverage, in-store ladder safety promotions, and displays at home shows.</td>
<td>Formative evaluations support local and national data to demonstrate that unsafe practice and ladder falls are an issue in New Zealand.</td>
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<td>40,370 New Zealanders, ages 25 to 59 years, reportedly experienced a primary public hospital admission for an injury caused by an unintentional fall. 28% of these falls occurred at home.</td>
<td>The program also aims to make use of trade shows, in-store promotions, staff training and competitions.</td>
<td>Examples of specific events hosted by the DIY Falls Campaign include double-page spreads, placed in local newspapers; media coverage; extensive advertising in local newspapers; comprehensive in-store Ladder Safety displays; Site Safe to provide staff training at Mitre 10 and Rangiora Hire; Dodgy Ladder Amnesty at Mitre 10; and, displays at local/regional home shows.</td>
<td>Impact evaluations show commitment to behavioural change relating to ladder use.</td>
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<td>Males are four times more likely to fall from a building or structure, or from a ladder or scaffolding, than females.</td>
<td>Program staff work with Mitre 10/Mitre 10 Mega, Rangiora Hire, the Brain Injury Association, a physiotherapist, Site Safe, and Accident Compensation Corporation.</td>
<td>Examples of program resources include brochures, branded giveaways (e.g., builders’ pencils, pens and plaster packs), ladder safety stickers for existing ladders, advertising material, posters showing unsafe practice, pull-up banners with ladder safety messages, displays, and signage for in-store promotions.</td>
<td>86% of those surveyed committed to behaviour change as a result of promotional material and media coverage of the issue.</td>
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<td>The DIY Falls program aims to reduce the incidence of ladder falls in the Waimakariri District (New Zealand).</td>
<td>Examples of program resources include brochures, branded giveaways (e.g., builders’ pencils, pens and plaster packs), ladder safety stickers for existing ladders, advertising material, posters showing unsafe practice, pull-up banners with ladder safety messages, displays, and signage for in-store promotions.</td>
<td>Examples of program resources include brochures, branded giveaways (e.g., builders’ pencils, pens and plaster packs), ladder safety stickers for existing ladders, advertising material, posters showing unsafe practice, pull-up banners with ladder safety messages, displays, and signage for in-store promotions.</td>
<td>58% of these respondents spoke to others about the issue, following coverage in local media.</td>
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<td>As a WHO Safe Communities initiative, the program seeks to raise awareness of the issues surrounding ladder falls, and to affect behavioural change towards safe practice when working at heights.</td>
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<td>The impact evaluations reveal a move towards behavioural change.</td>
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The program engaged the local community and ultimately increased their awareness of ladder safety, and the importance of ladder safety.
INTRODUCTION

Unintentional Home Injury

Unintentional injury is a major public health problem. In the United States (U.S.), unintentional injury is the leading cause of death for individuals ages 1 to 34, and the fifth leading cause of death in the U.S. (Runyan and Casteel, 2004) (see appendix A, Table 1). On average, more than 91,000 individuals die each year from an unintentional injury, with approximately 20% of these deaths occurring in the home (ibid).

An even larger percentage of unintentional injuries that are nonfatal occur in the home. Of all nonfatal unintentional injuries reported, 42% occur in the home. This translates to nearly 12 million nonfatal home injuries occurring each year. Unintentional home injuries account for nearly 21 million medical visits each year, as individuals spend more than $222 billion annually in medical costs relating to home injuries (ibid).

The Home Safety Council (U.S.) has released a report entitled, “The State of Home Safety in America”, which outlines facts surrounding unintentional injuries in the home (Runyan & Casteel, 2004). The report documents the occurrence of fatal and nonfatal unintentional injuries in the U.S.,\textsuperscript{15} as well as the societal costs associated with home injury, and safety issues and protective practices associated with injury at home (ibid.) The mandate of the Home Safety Council, a nonprofit organization, is to “…[help] prevent the nearly 21 million medical visits that result on average each year from unintentional injuries in the home” (ibid., 2).

According to the Home Safety Council, approximately 18,000 unintentional home injury deaths occurred each year in the years between 1992 and 1999—a figure which

\textsuperscript{15} Excluding suicide, homicide, family violence and other forms of assault.
represents 6.83 deaths for every 100,000 persons in the U.S., or approximately 20% of all deaths due to injury (Table 2) (Runyan & Casteel, 2004). Between 1997 and 2001, falls accounted for one-third of all unintentional home injury deaths and more than 40% of nonfatal unintentional injuries. More than one-third of all nonfatal home injuries that took place between 1993 and 2000 resulted in emergency department care (ibid).

The highest rates of unintentional home injury death amongst all age groups were experienced by older adults, both male and female. People 80 years of age and older experienced injury deaths at rates more than 20 times the rate of those younger than 80 years of age (ibid) (see Appendix A, Figure 1). Although males experienced substantially more fatal unintentional injuries at home than females (see Appendix A, Figure 1), females experienced slightly more nonfatal home injuries than males.

Approximately 10 million unintentional home injuries were seen by U.S. emergency departments each year, between the years 1993 and 2000 (see Appendix A, Table 3) (Runyan & Casteel, 2004). During this time, falls were the leading cause of emergency department visits for unintentional injuries occurring at home, accounting for an estimated 3.8 million emergency department visits each year (see Appendix A, Table 3) (ibid.).

In sum, the Home Safety Council report demonstrates the magnitude of the problem of unintentional injury occurring in the home. The report also improves the breadth of understanding surrounding the issue and provides an impetus for the design of preventative initiatives and approaches.
**Falls within the New Zealand Context**

In New Zealand, falls account for a significant burden of injury. Self-reported injury data from New Zealand indicates that nearly a third of injuries sustained occur within the home (Coogan, Cooper & Adams, 2002). In 2004, for instance, the 25 to 55 year age group accounted for over 50% of the $150 million in Accident Compensation Corporation (ACC) claims for moderate to serious falls in the home (ACC, 2005).

A recent review conducted by the New Zealand Health Information Service (NZHIS) considers unintentional fall-related fatality data (from falls taking place within the home) and primary public hospital admission data for 25–59 year olds (Kool et al., 2007). The findings included the following:

- 40,370 New Zealanders ages 25 to 59 years had a primary (first admission) public hospital admission for an injury caused by an unintentional fall, during the 12-year period between 1993 and 2004; 28% (n=11236) of these falls occurred at home;
- The mean age of hospitalized cases was 44.9 years;
- Rates of hospitalization increased three to four-fold across the age range;
- Male rates were higher than female rates until 45 years of age;
- Falls on the same level were responsible for almost a third of all hospitalizations, and falls involving stairs or steps accounted for 19%;
- Males were four times more likely to fall from a building or structure, or from a ladder or scaffolding than females; and,
- Females were almost twice as likely to fall on the same level as males and to have a fall involving stairs or steps.
With respect to injury deaths relating to unintentional home falls, notable findings (Kool et al., 2007) include:

- 281 New Zealanders ages 25 to 59 years died from unintentional fall-related injury during the 10-year period between 1993 and 2002; 26% (n=73) of these falls occurred at home;
- The mean age of victims was 47.6 years. There were insufficient deaths to examine ethnic differences;
- People ages 55 to 59 years had a falls rate that was about three times higher rate than those aged 25 to 29 years;
- The fatality rate for males was three times that for females;
- The most common type of fall was falls from buildings or structures;
- Men were most likely to die as a result of a fall from a building or structure; and,
- Females were most likely to die as a result of a fall involving stairs or steps.

Taken together, these results demonstrate that almost one third of unintentional falls resulting in in-patient admission or death amongst working age people occur at home (ibid). Rates of hospitalization due to fall-related injury at home increase three to four-fold across this age range. The steady increase in rates of injury from about 45 years of age onwards suggests that consideration should be given to commencing fall prevention initiatives at an earlier age than traditionally has been the case, particularly since the potential adverse effects on economic productivity from falls of this nature in this age group are significant.
These findings also demonstrate the need for future research and policy to identify modifiable risk factors that can be targeted to reduce the burden of these injuries, and their consequences.

**Falls within the Canadian Context**

In Canada, over 42,000 workers sustain injuries each year from injuries involving falls (Canadian Centre for Occupational Health and Safety, 2013). This number represents about 17% of the “time-loss injuries” that were accepted by workers’ compensation boards or commissions across Canada (Association of Workers' Compensation Boards of Canada, 2011). The majority (66%) of these falls take place on the same level, and result from slips and trips (ibid). The remaining 34% are falls from a height (ibid).

**Ladder Falls: Ontario, Canada Case Study**

*On average, each month close to 100 people are hospitalized for a fall from a ladder. Adult males had the highest rate of injury. Ontario Injury Compass, 2009*

During the 2005/06 fiscal year, a total of 8,757 emergency department visits and 1,170 hospitalizations for falls from ladders were reported (Ontario Injury Compass, 2009). These numbers translate into provincial rates of 66.2 per 100,000 for emergency department visits and 8.4 per 100,000 for hospitalizations (see Appendix A, Figure 2) (ibid).

Injuries to the lower and upper limbs were the most common type of injuries for emergency department visits, accounting for 31% and 29% of emergency department
visits, respectively (Ontario Injury Compass, 2009). More specifically, fracture of the ankle, foot, knee, and lower leg were the most commonly presented injuries for emergency departments, along with fracture of the forearm and open wound of the head (ibid) (see Appendix A, Figure 3).

Injury rates tend to vary by region, with the highest overall rates reported in the northern region of the province, followed by the southwest region, for emergency department visits and hospitalizations (see Appendix A, Table 4). For each region, adults aged 40 to 65 years of age represent the highest rates of emergency department visits and hospitalizations (See Appendix A, Table 5). A 2009 study found that approximately 8% of these people were admitted as in-patients directly from ambulatory care (Ontario Injury Compass, 2009), while for hospitalized cases, just over 70% were triaged, registered and assessed by a service provider, with treatment initiated (these people left against medical advice before the treatment was completed) (ibid). Another 12% were triaged, registered and assessed by a service provider, then left without treatment (ibid), and approximately 10% were discharged home (ibid). The 1,170 hospitalized cases accounted for more than 6,161 days in acute care hospitals, with an average length of stay of 5.27 days (ibid).

At first glance, ladders may appear to be relatively harmless. Used improperly, however, these tools can lead to serious injury. As demonstrated, falls from ladders can lead to permanent disability or death. In comparison to other household consumer products, ladders are associated with some of the highest rates for injury and longest durations of incapacity (Runyan et al., 2005; Faergemann & Larsen, 2000; Partridge, Virk, & Antosia, 1998; Muir & Kanwar, 1993; Björnstedt & Johnsson, 1992).
DIY Falls Campaign Program

The goal of the Do-It-Yourself (DIY) Falls Campaign program is to reduce the incidence of ladder falls in the Waimakariri District of New Zealand. The program aims to raise awareness of the issues surrounding ladder falls and to affect behavioural change towards safe practice when working at heights. In line with these aims, the primary objectives of the program are to educate the public about the risk factors associated with falls from heights, and to affect a commitment to behavioural change towards safe practice with respect to ladder use.

DIY Falls & World Health Organization International Safe Communities Model

As found on the World Health Organization’s (WHO) website, the Manifesto for Safe Communities states, “all human beings have an equal right to health and safety” (WHO Safe Communities, 2013). The Safe Communities concept was first introduced as a policy initiative during the First World Conference on Accident and Injury Prevention that was held in Stockholm, Sweden, in September 1989 (ibid.). The Safe Communities approach has been embraced around the world as a model for coordinating community-oriented efforts to enhance safety and to reduce injury (Svanstrom, 1997; Sznajder, 2002; Zhao, 2003). The Safe Communities ideology is consistent with the idea that safety can be achieved through integrated, collaborative efforts that are implemented in a supportive social, cultural and political environment. It is for this reason that partnerships that unite various community members and groups are an essential component of the Safe Communities process.
As mentioned, a Safe Community is one in which all groups within a community work together in a coordinated way to reduce injury and to promote safety. The key feature of this approach is the creation of a local coalition or committee comprised of community, business and government leaders that combine their resources and talents to “tackle injuries” in all contexts and causes. These coalitions do not re-invent the health and safety wheel; instead, they use resources already available to their local community and work together towards the same goal of eliminating local injury (ibid). The strength of the Safe Communities Model lies in its simple and easily understandable premise: it represents a “common sense program” that is based on and uses existing networks in society for the promotion of safety (ibid). Safe Communities programs have been initiated all over the world and are part of a growing network for the exchange of knowledge, shared experience and research findings.

Communities are eligible for international recognition and accreditation through the WHO if they meet seven indicators: an infrastructure that is rooted in partnerships and collaborations and governed by a cross-sectional group that is responsible for safety promotion in their community; long-term, sustainable programs covering both genders and all ages, environments and situations; programs that target high-risk groups and environments and promote safety for vulnerable groups; programs that are based on the available evidence; programs that document the frequency and causes of injury (both unintentional and intentional); evaluation measures to assess programs, processes and the effects of change; and, ongoing participation in national and international Safe Community networks (WHO Safe Communities, 2013). For more information on the Safe Communities Model, please visit the official WHO Safe Communities website.
Looking now at the current project, the Waimakariri District has been an accredited District to the WHO ‘International Safe Community’ since 1999. At this time, it became the second community in New Zealand to achieve such a status. The District has since been re-accredited in 2006, and again in 2013. Presently, a community-led governance group guides and supports strategic direction in Community Safety across the District.

Supported by this governance group, Community Safety is facilitated by Crime, Injury and Road Safety coordinators who work collaboratively to address identified community needs. These coordinators work under the umbrella of Waimakariri District Council’s Community Team and are independently funded by the Ministries of Health and Justice, and the New Zealand Transport Agency. The Community Team, comprised of these coordinators, brings together existing organizations that are working in the areas of community development; youth development; injury, crime and road safety fields; restorative justice; and, social service co-ordination.

RESOURCES

The program aims to engage and inform DIY handymen/women and their families with a comprehensive media campaign, and to make use of trade shows, in-store promotions, staff training and competitions. Program staff works with Mitre 10/Mitre 10 Mega—a retail and trade hardware store chain, Rangiora Hire—an equipment hire company, the Brain Injury Association, Site Safe, Accident Compensation Corporation and a physiotherapist.
**Mitre 10/ Mitre 10 Mega**

The New Zealand company Mitre 10 ([www.mitre10.co.nz](http://www.mitre10.co.nz)) operates 100 stores throughout the country. Mitre 10 has been an integral part of New Zealand’s DIY culture since 1974. (Mitre 10, n.d.). In 2004, Mitre 10 opened its first Mitre 10 Mega store to offer customers an increased product range and additional services.

A trusted part of the hardware retail landscape, Mitre 10 was recently voted New Zealand’s most trusted home improvement store. With respect to ladders, Mitre 10 has a wide product range of ladders and is an invaluable stakeholder in the DIY Falls program.

**Rangiora Hire**

Rangiora Hire is a leading equipment hire company in New Zealand ([http://www.rangiorahire.co.nz](http://www.rangiorahire.co.nz)) (Rangiora Hire, n.d.). The company provides equipment for hire to tradespersons, farmers and DIY handymen/women, offering a wide range of ladders for hire.

**The Brain Injury Association (New Zealand)**

In New Zealand, there are 14 Regional Brain Injury Association offices that provide support, education and information services ([http://www.brain-injury.org.nz/index.html](http://www.brain-injury.org.nz/index.html)) (Brain Injury Association, n.d.). The primary goal of the Brain Injury Association is to increase awareness and prevention of head injury throughout New Zealand. To achieve this goal, the Association builds and maintains relationships with community groups, schools, sport groups and businesses to ensure that people in the
community are aware of the impact a head injury has on a person’s life (and particularly on their relations with family, friends, employers/co-workers and others).

**Site Safe**

Site Safe is an incorporated society, established by members of the construction industry, which operates on a not-for-profit basis. Its stated mission is to promote a culture of safety in the New Zealand construction industry ([https://www.sitesafe.org.nz](https://www.sitesafe.org.nz)) (Site Safe, n.d.). Site Safe’s membership, including its industry networks and partnerships, act as the leading advocate for construction workplace health and safety. Site Safe is the industry’s professional body for construction health and safety in Zealand. To this end, the organization advises, trains, and coaches employers and workers to provide safer sites. Finally, Site Safe provides a range of services, which include training, audits, consulting and safety products.

**Accident Compensation Corporation (ACC)**

The Accident Compensation Corporation (ACC) provides comprehensive, no-fault personal injury cover for New Zealand residents and visitors to New Zealand ([http://www.acc.co.nz](http://www.acc.co.nz)). As a Crown organization, the ACC’s role, which is to prevent injury and to provide access to treatment for those who require assistance, is set out by the Government. In carrying out its role, the ACC carries out a number of activities, including: receiving clients’ injury claims and informing them whether or not they are able to assist; overseeing and coordinating treatment for the client; paying weekly compensation (a regular form of income, calculated at a percentage of the client’s typical
earnings); helping to pay for a wide range of treatment and medical costs, ranging from
general practitioner visits and specialist fees, to x-rays, prescription costs and hospital
emergency services; collecting levies to help pay for the services provided by the ACC;
and, working with businesses and the local community to help the community become a
safer, injury-free place.

Other Program Resources

There are a number of program resources for DIY Falls. Program resources are
visually appealing, comprehensive and readily available to community members.
Examples of program resources include brochures, branded giveaways (e.g., builders’
pencils, pens and plaster packs), ladder safety stickers for existing ladders, advertising
material, posters showing unsafe practice, pull-up banners with ladder safety messages,
displays, and signage for in-store promotions (Figures 4 and 5).
Figure 4. DIY Falls: Take Time Before You Climb Program Resources

DIY FALLS
TAKE TIME BEFORE YOU CLIMB

PROGRAMME RATIONALE:
Ladder Falls are a significant cause of injury in New Zealand. Leading to an estimated $4-$6 million in claims and affecting around 16,000 people annually.

In the 12 month period, prior to June 2007, 1,349 ladder related accidents were recorded at 436 falls. Some of these ladder falls claimed the lives of four individuals. DIY Falls resources are available at no cost and these are widely used.

TARGET GROUP:
40 - 49 year old males: shown to be the most affected demographic group.

PROJECT PARTNERS:
Site Safe, Accident Compensation Corporation (ACC), Mitre 10 Mega, Rangiora Physiotherapy, Rangiora Hire, the Brain Injury Association, St John’s Ambulance

BUDGET:
$9000.00

RESOURCES:
- Brochures
- Branded giveaways (builders pencils, pens and plaster packs, etc.)
- Ladder safety stickers for existing ladders
- Advertising material
- Posters showing unsafe practice
- Pull-up banners, with ladder safety messages
- Mannequin Display
- Signage for in-store promotions

THE PRE-CAMPAIGN PICTURE:
Formative evaluation findings:
- 30% were using ladders with missing side locking straps, or plastic feet
- 4% were using ladders with missing rungs
- Only 30% always secured their ladder when using repeatedly in one place
- More than 50% regularly used their ladder as a work surface
- 58% used loose material to level their ladder
- 60% stood on the top two steps when working
- 22% had experienced a ladder fall
- 57% had experienced a near-miss

CAMPAIGN PROCESS EVALUATION:
- Staff training attended by DIY and Hire centre staff; with requests for follow-up sessions
- 7 “Dodgy” ladders were scrapped
- 798 local people reached, through competitions and presentations
- 5 contractors took resources for employees/employers, and/or inquired about employee training
- Numerous injury stories recounted
- Extensive media coverage (see below)

WHAT MADE THIS PROJECT SUCCESSFUL?
- Eye-catching visual displays
- Good promotional material
- Useful, branded giveaways
- Using questionnaires attached to competitions as an evaluation tool
- Good buy-in from local media (including a double page feature and five articles in local newspapers)
- The degree of commitment from coalition partners, particularly Mitre 10 Mega.
- The recognition from within the community that this is, in-fact, a significant injury issue

WHAT MIGHT BE DONE DIFFERENTLY NEXT TIME?
- Keep a register of those making inquiries about workplace training, rather than just passing the information on to them
- Give away Site Safe Staff Training vouchers to those making inquiries
- Better data and resources from the Brain Injury Association
- Use local personalities for promotions (E.g. MPs)
- Measure local hits on ACC and Site Safe websites
- Lobbying manufacturers and government organisations regarding quality standards for ladders

IMPACT EVALUATION FINDINGS:
- Staff were more likely to talk about the issue
- ladder present awareness in the office had doubled
- The number of people using stud only to hold their ladder had decreased by 40%
- The number of people falling over to hold the ladder had decreased by 80%
- The number of people using their ladder as a work surface had decreased by 20%
- Most importantly, 2/3 of questionnaire respondents had committed to adopting safer practice when working at height

WHAT WOULD YOU DO DIFFERENTLY NEXT TIME?
- Staff training attended by DIY and Hire centre staff; with requests for follow-up sessions
- 7 “Dodgy” ladders were scrapped
- 798 local people reached, through competitions and presentations
- 5 contractors took resources for employees/employers, and/or inquired about employee training
- Numerous injury stories recounted
- Extensive media coverage (see below)

WHAT MIGHT BE DONE DIFFERENTLY NEXT TIME?
- Keep a register of those making inquiries about workplace training, rather than just passing the information on to them
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- Lobbying manufacturers and government organisations regarding quality standards for ladders

Source: DIY Falls Campaign

Figure 5. DIY Falls: Take Time Before You Climb Program Resources

Source: DIY Falls Campaign
**Operating Budget**

The operating budget for a DIY Falls Campaign is flexible. The budget used for the Waimakariri District Campaign was $4000.00 NZD (approximately $3500.00 USD). Additionally, the implementation of the DIY Falls program does not require much capital. Once working relationships have been established with local retailers and organizations, the costs required for the implementation of the campaign are directly related to public education about the risk factors associated with falls from ladders. This public education piece aims to affect a commitment to behaviour change.

**IMPLEMENTATION**

The implementation of the DIY Falls program is achieved through the use of distinctive branding; case studies to personalize the campaign; staff training at local DIY outlets and stores; comprehensive media coverage; in-store ladder safety promotions; and, displays at home shows.

The DIY Falls Campaign has four main initiatives that seek to raise awareness and to educate the local community. First, in order to reach its intended audience, the campaign uses mass media coverage to highlight the physical, emotional and financial costs of falls from ladders and their resulting injuries. To this end, case studies are used to give ‘faces’ to the campaign (see Figure 6 and Appendix B). Second, a ladder amnesty—an initiative that gives individuals the opportunity to trade in their old, damaged and broken ladders for new ones at discounted prices—is operated through Mitre 10. Third, Site Safe training is provided to staff of local DIY and hire outlets. This training serves to
enhance staff skills in assisting customers who are purchasing equipment for working from height. Fourth and finally, promotion and trade shows are hosted to educate the community on the dangers of unsafe ladder use.

**Examples of Specific Events**

Several initiatives and events are hosted by the DIY Falls Campaign. These initiatives and events include:

*Media Coverage*

To develop a brand for the campaign, double-page spreads and newspaper articles were placed in local newspapers, including case studies (see Lindsey’s Story and Appendix B) and information about safe ladder use (see Figure 6). The ads are straightforward (written in plain language), easy to read and eye-catching. Moreover, they convey to their audience a number of significant facts and tips relating to ladder safety. The personal case studies of people who have experienced ladder falls were used to make the ads more relatable to community members (see Lindsay’s Story box).

The DIY Falls Campaign also employs extensive advertising of program initiatives (see Figure 7) in local newspapers to attract individuals to program events (e.g., ladder amnesty events where community members can be provided with promotional materials and training on ladder safety).
Figure 6. DIY Falls: Take Time Before You Climb Program Advertisement

Source: DIY Falls Campaign

Figure 7. DIY Falls: Take Time Before You Climb Program Advertisement

Source: DIY Falls Campaign
Lindsay’s Story

Falling off a ladder—hah. That would never happen to me. That’s what Lindsay thought too, until the day four years ago he fell backwards off a ladder into a rock garden and was knocked unconscious.

“I just rushed in to get the job without taking the proper care,” he says. Lindsay suffered a head injury and once a successful car dealer now struggles to do a couple of hours of manual labour at a time.

“I’ve completely lost my confidence and struggle making even the simplest decisions.”

What makes it even harder Lindsay says is that people think he’s Ok, but he’s not. “People don’t understand head injury, because they can’t see it. They wonder why you are on a sickness benefit when you can obviously walk and talk.”

The physical impact of a head injury can be extremely debilitating. Symptoms include:

• Short-term memory loss
• Chronic fatigue
• Noise intolerance;
• (Can’t shut out background noise)
• Easily startled by loud noise
• Can’t listen to favourite music anymore
• Can’t visit busy bars or restaurants
• Speech difficulties; e.g., getting lost in the middle of a sentence
• Severe light intolerance
• Radical changes in behaviour:

For Lindsay, all of this means he cannot function socially as he used to. The fall and the resulting injury has cost him dearly. He has lost his partner, his family, his work, and due to the dramatic behaviour changes which lead to him making rash impulsive decisions, he has even lost his home.

“My family has suffered as a result of this – even my children stay away so as not to upset me.”

A moment’s inattention and a life changed forever.

Source: DIY Falls Campaign
Promotions through the Stakeholders

The DIY Falls Campaign would not be possible without the assistance of its program stakeholders. As mentioned, one of the main stakeholders of the DIY Falls New Zealand Campaign is Mitre 10 Mega. Mitre 10 Mega hosts a comprehensive in-store ladder safety display that includes a prize draw meant to solicit impact evaluation information, giveaways, and visual and video displays (e.g., “Great Ways to End up in Hospital”). Mitre 10 Mega is also responsible for hosting events such as the Dodgy Ladder Amnesty, which encourages the public to discard unsafe ladders. During this event, 120 local people received information and program resources; a few of these people returned three ladders for scrapping, four of these people returned home to scrap their ladders, and two of these people took information to give to employers and/or employees.

Stakeholder Training

Site Safe provides staff training at Mitre 10 and Rangiora Hire to ensure sales staffs are well-equipped and informed about safe ladder use. Knowledgeable staffs are critical to program success, as staffs work directly with the public to make suitable and safe choices when purchasing equipment. During the New Zealand Campaign, about fifteen staff members received Site Safe training on falls from heights at both Mitre 10 and Rangiora Hire.

Trade Shows

The DIY Falls program encourages displays and booths at local and regional homes, as well as trade shows. At these events, ladder safety resources, which convey the
importance of ladder safety, are displayed. The displays and booths typically include a mannequin falling from a dodgy ladder and various promotional materials (e.g., brochures, safety stickers to fit to existing ladders, branded giveaways). Competitions are also hosted that seek to raise awareness of what is considered to be unsafe ladder practice (e.g., “What’s wrong with this picture?”).

These events have proven to be very successful. In New Zealand, a display was set up at the Rangiora Agricultural and Pastoral Show, where 70 people were given program resources. At the Oxford Agricultural and Pastoral show, another event, 95 entries were recorded in the “What’s wrong with this picture?” competition.

It should be noted that there is a lot of flexibility regarding how the program is administered. By employing extensive media coverage and stakeholder engagement, it is possible to reach a large audience and to educate them on ladder safety.

OUTCOME

Formative and impact evaluations were conducted to demonstrate the effectiveness of the DIY Falls Campaign in New Zealand’s Waimakariri District (see Figure 8). Formative evaluation results reveal that 22% of respondents experienced a ladder fall, while 57% experienced a near miss. The majority of community members, when questioned about their behaviours, admitted to engaging in unsafe practice when using ladders. Findings from the formative evaluations include the following: 30% of ladder owners reported that their ladders were missing side locking straps or plastic feet, while 4% of owners were using ladders with missing rungs; 30% of respondents always
secured their ladder when using it repeatedly in one place; more than 50% of respondents have used their ladders as a work surface; 58% of respondents had placed something under one side of their ladders to make them level; 60% of respondents stand on the top two steps of their ladders when working; 22% of respondents claimed to have experienced a ladder fall, while 57% experienced a near-miss.

In sum, the formative evaluation results from this project support local and national data relating to ladder falls: it is confirmed that ladder falls are an issue in the Waimakairiri District.

**Figure 8: DIY Falls: Take Time Before You Climb Survey**

![Survey Image](Source: DIY Falls Campaign)

The results of the impact evaluations, similar to the formative evaluations, demonstrate a commitment to behavioural change in relation to ladder use. More specifically, the reported figures speak to the impact of the DIY Falls Campaign, from the perspective of the program participants: 86% of respondents committed to behavioural change as a...
result of promotional materials and media coverage of the issue; and, 58% of respondents had spoken to others about the issue, following coverage in the local media.

Comparisons between the formative and impact evaluation questionnaires reveal a 51% increase in the number of people who were assisted by someone who held their ladders while they climbed; a 60% increase in the number of people who no longer used something to level their ladders; and, a 32% decrease in the number of people using their ladders as work surfaces.

The impact evaluations demonstrate a move towards behavioural change. It would seem that the DIY Falls program engaged the local community to successfully increase their awareness of ladder safety, as well as its importance. It is thought that several factors contributed to the overall success of the program, including: eye-catching visual displays; effective promotional material; useful, branded giveaways; solid buy-in from local media, including a double-page feature and five articles in the local newspapers; the use of questionnaires attached to competitions as an evaluation tool; the degree of commitment from coalition partners; and, the recognition from within the community that the issue is, in fact, a significant one.

CONCLUSION

The DIY Falls Campaign successfully employed a number of best practices, such as eye-catching visual displays, excellent promotional materials, a high degree of buy-in from the local media, and collaborative partnerships with stakeholders (e.g., Mitre 10 and Rangiora Hire). These strategies allowed the campaign to receive recognition and to
convey to the community that falls from ladders is a significant issue faced by individuals, and more specifically by mid-life adults.

The stakeholders associated with this program played a crucial role in the successful implementation of the program. By displaying program brochures, posters, banners and signage, and by offering in store promotions and staff training, they were effectively able to support the achievement of the program’s objectives.

A significant benefit of the DIY Falls program is its transferability and applicability to various communities, globally. The program is easily replicated, inexpensive to administer, and can be adapted for all age groups, and even industry professionals. The program can also be extended to other DIY issues, including protective hearing aids, the use of power tools, and so on.

Suggested improvements to the program have been recommended in recent years. Some of the more salient suggestions include: providing Site Safe training vouchers to community members who inquire about this issue or the program; keeping a register of the people who make inquiries about workplace training rather than simply passing along this information; reviewing the existing data and resources from the Brain Injury Association to make improvements as needed; using local personalities for promotions (e.g., Members of Parliament); measuring local website traffic on the ACC and Site Safe websites; and finally, lobbying for quality ladder standards.
REFERENCES


Runyan, C. W., Casteel, C., Perkis, D., Black, C., Marshall, S. W., Johnson, R.


**Images:**

DIY Falls Take Time Before You Climb Double Page Poster. Waimakariri District Council

Don't Let It Be You. DIY Falls Take Time Before You Climb. Waimakariri District Council

Don’t Let It Be You - DIY Falls Take Time Before You Climb. Advertisement. Waimakariri District Council

DIY Falls Take Time Before You Climb Small Poster. Waimakariri District Council

DIY Ladder Safety Vehicle. Waimakariri District Council
Table 1. Leading Causes of Death by Age Group, All Races, Both Sexes, U.S., 2001.

![Table 1](image)

Source: Runyan and Casteel, 2004

Table 2. Unintentional Home Injury Deaths. Average Annual Number, Percentage and Rate (per 1000,000 persons), All Causes, U.S., 1992–1999.

![Table 2](image)

Source: Runyan and Casteel, 2004
Figure 1. Unintentional Home Injury Deaths. Average Annual Rate (per 1000,000 persons), by Age Group and Sex, U.S., 1992-1999.

Table 3. Nonfatal Unintentional Home Injuries Resulting in Emergency Department Visits. Average Annual Number and Rate (per 1000,000 persons), All Causes, U.S., 1993–2000.
Figure 2. Emergency department visits for falls from ladders by age and sex, Ontario, 2005/06.

Source: Ontario Injury Compass, 2009

Figure 3. Emergency department visits for falls from ladders by age and sex, Ontario, 2005/06

Source: Ontario Injury Compass, 2009
Table 4. Regional comparison of falls from ladders, Ontario, 2005/06
Source: Ontario Injury Compass, 2009

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* Age-standardized rate per 100,000 population. Note: Region of residence unknown/outside of Ontario for 120 emergency department visits and 7 hospitalizations.

Table 5. Regional comparison of ER visits and hospitalizations for falls from ladders in the adult population, by age group, Ontario, 2005/06

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<tr>
<td>Number</td>
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<td>140</td>
<td>190</td>
<td>207</td>
<td>185</td>
<td>156</td>
<td>123</td>
<td>1,170</td>
</tr>
<tr>
<td>Rate per 100,000*</td>
<td>10.9</td>
<td>19.2</td>
<td>7.8</td>
<td>8.6</td>
<td>5.3</td>
<td>8.0</td>
<td>12.6</td>
<td>8.4</td>
</tr>
<tr>
<td>Average Age</td>
<td>65</td>
<td>62</td>
<td>62</td>
<td>57</td>
<td>64</td>
<td>55</td>
<td>53</td>
<td>64</td>
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<tr>
<td>% Male</td>
<td>60</td>
<td>64</td>
<td>66</td>
<td>92</td>
<td>92</td>
<td>70</td>
<td>69</td>
<td>97</td>
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</tbody>
</table>

* Age-standardized rate per 100,000 population. Note: Region of residence unknown/outside of Ontario for 120 emergency department visits and 7 hospitalizations.
APPENDIX 2: Examples of Promotional Material

Tips To Avoiding Ladder Injuries

Take a close look at your ladder before you use, it could spare you an accident. Did you know the main causes of ladder injuries are ladders that are in poor condition, the wrong size, not installed properly or not used properly? Just to be on the Safe Side, follow these tips to help avoid a ladder accident.

1. Start by selecting the right ladder for the job
2. Always check the ladder before you use it. Inspect metal ladders for bends or breaks and wood ones for cracks.
3. Ladders are to provide access only – don’t use ladders as work platforms
4. Ladders must be the proper length – straight ladders should extend at least one metre (1m) above the platform.
5. Lean the ladder against something solid – not a glass surface. Make sure its at a safe angle with the base well away from the wall and secure immediately.
6. Keep ladders away from doorways or walkways
7. Do not stand on the top two steps. Work only from the third step down – this gives you something to hold onto.
8. Keep the rungs free of grease, paint, mud or anything slippery.
9. Don’t carry tools up the ladder in your hands – keep your hands free for climbing. Put tools in a tool-belt, builder’s pouch or backpack. Heavy items should be pulled up to the worksite on a rope.
10. Keep three points of contact with the ladder at all times – two hands and one foot, or two feet and one hand.
11. Always face the ladder – never come down with your back facing the rungs
12. Set ladders up on firm, level surfaces – don’t use loose material such as boxes or bricks to make adjustments for uneven surfaces.
13. Never over-reach – keep your belt buckle within the side support styles and get off to move the ladder if necessary, don’t be tempted to rock or jog it.
14. When you are finished clean and store the ladder properly so its ready for you to use next time.

Source: DIY Falls Campaign

How To Position Ladders Correctly

You should:

- Position straight ladders at a ratio of approximately 1 metre out for every four metres in height to the leaning surface.
- Stepladders should be fully opened, with both stay bars locked when in use.
- Place the ladder on a firm, level surface. Putting it on soft or uneven ground could cause it to lean and topple under your weight. If the ground is soft, place something
firm underneath the ladder, such as a sheet of plyboard. To prevent the ladder from slipping:

- Make sure it has slip-resistant feet.
- Place blocks behind the feet.
- Have someone hold the ladder while you are on it. This person should secure the base of the ladder with their feet, and hold onto the ladder with both hands.
- Ensure straight ladders project one metre above the landing place, e.g., the roofline.
- Always tie a straight ladder to something stable, as close as possible to the point of support, to prevent movement. It’s a good idea to keep some synthetic cord permanently looped around an upper rung, to use for this purpose. Cord between 4mm and 8mm is ideal. Look for something to tie the ladder to before you position it, even if this means shifting the ladder away from the main point of access for the job at hand.

Source: DIY Falls Campaign

### This Could Be You

**Occupation:** Self-employed builder

**Injury:** Fell off the roof of a second story building and sustained fractures to his right wrist and the heel bone of his left ankle.

**Time off work:** Initially had 12 weeks off work, then returned on graduated duties. However three months later he aggravated the ankle injury when he had to do sustained work on the roof as he lacked the ability to turn his foot in and out. This required a further 12 weeks off work.

**Total time off work:** 24 weeks

**ACC Payment:** Received 80% of his normal wages for the 24 week period, but due to reduced hours he is now able to work, it is more like a 25% loss of income for the year.

**Future loss of Earnings:** Due to his ability to do less hours on heavy job tasks his future income is down by 5 – 10%.
<table>
<thead>
<tr>
<th>Social Limitations:</th>
<th>He is no longer able to water ski which was a large part of his recreation. He is also no longer able to go hunting and has limited snow skiing ability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future prospects:</td>
<td>Ankle pain is still an issue and could become more so with the toll general wear and tear sustained during building work takes on the injury. In time he may need to have the ankle fused to deal with this which will further affect earnings.</td>
</tr>
</tbody>
</table>

Source: DIY Falls Campaign

**Falling For Appearance**

The statistics paint a sobering picture of the dangers of this approach. Fall off a ladder and you risk sustaining severe fractures, head and spinal injuries. One of the reasons ladder falls can be so dangerous is that generally, there’s little time to adjust your body before you hit the ground. In other words, you land the way you fall.

Studies have shown that humans can jump safely from a height of several metres, provided they jump intentionally and land correctly. Most ladder falls don’t allow this opportunity. What’s more, you don’t need to fall very far to hurt yourself. In fact, most injuries are sustained in falls from 2-3 metres, with a fatality even recorded in a fall from just 1.5 metres.

How can you ensure you’ll come down safely, every time you use a ladder?

Here are some simple guidelines that will help.

- Assess the job
- Identify the hazards:
- Ask yourself “Is a ladder the best tool for the job?”
- Remember, the main function of a ladder is to provide access – it’s not a work platform. Standing on a ladder for too long can be fatiguing. And you can’t take too many tools with you, either. So, consider whether some sort of work platform, eg scaffolding, trestles, would be better.

Using a work platform can also save time, since you won’t need to reposition it as often as you would a ladder. And it will offer better access to the area you’re working on, especially if you’re painting. All this can add up to a better quality finish!

Injury Prevention Waimakariri would like to acknowledge ACC for providing this information.
Source: DIY Falls Campaign
Tai Chi for Health Institute

By Marina Bourlak

Population Served: Mid-life

Contributing Author Contact Information

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Program Creator and Institute Director
Tai Chi for Health Institute
6 Fisher Place, Narwee, NSW, 2209, Australia
p +61-2 95336511
 DrPaulLam@TaiChiforHealthInstitute.org
www.tchi.org
## Background

Developed in 1997 by Dr. Paul Lam and a team of tai chi and medical experts in Australia

Original program was developed for individuals with arthritis

Other programs emerged, including for back pain, falls, diabetes, and osteoporosis

Tai chi has been a safe and effective method to reduce pain and improve balance, coordination and strength

Guiding principles of tai chi: movement control, weight transference, integration of mind and body

Institute trains participants to become trainers (MTs and STs)

Primary, secondary and tertiary levels of prevention

## Resources

Tai chi an easy to learn, low-bearing exercise, and effective program to treat chronic pain

No governmental or research support

Institute supported by the Arthritis Foundation and many health agencies around the world

Cost for participants: cost of instructional videos and books range $10 to $50, with some at no cost

To become MT and ST, do not pay any licensing or franchise fees

Members pay an annual fee

## Implementation

Typical classes include 10 minutes of warming up, 40-45 minutes of tai chi, and 5-10 minutes of cooling down

Highly encouraged to supplement practicing tai chi at home every day for at least 20 minutes

Institute offers instructional DVDs, CDs and books to teach tai chi

Institute travels globally to offer master classes to teach instructors how to effectively implement tai chi for health benefits

## Outcomes

Works to improve balance, confidence and muscular strength

Program has been implemented and evaluated worldwide

Various types of tai chi, however, Sun-Style tai chi has been specifically designed for arthritis

Promotes balance, control, flexibility and bone health

8-16 weeks of tai chi training has shown to improve balance, flexibility and reduce the number of falls

Tai chi has been effective in increasing balance, coordination, muscle strength; while decreasing stress, anxiety, depression, and increasing self-esteem
INTRODUCTION

Tai chi, a form of martial arts, originated in ancient China and has been widely practiced since. This type of exercise combines slow sequential movements with mind-body control, often described as “meditation in motion”. Tai chi has been described as exercise that promotes stress reduction, improves balance and flexibility (Li, Hong & Chan, 2001; Zhang, et al, 2006; Fuzhong, et al., 2012; Qin, et al., 2005; Wolf, et al., 1996; Taylor-Piliae & Froelicher, 2004; Maciazek, et al., 2007), increases relaxation, and improves overall mental well-being (Wang, et al., 201; Jimenz, Melendez & Albers, 2012). Additionally, The National Center for Complementary and Alternative Medicine (NCCAM) has identified Tai Chi as a form of complementary and alternative medicine.

The origin of Tai Chi is unknown, but the earliest reference and credit has been given to Zhang Sanfeng (12th century), whom historians claim was a legendary Chinese Taoist priest. He originated the concepts of neijia, a soft and internal form of martial art, often referred to as T’ai chi ch’uan. He developed a set of 13 exercises that were replicas of the various movements of animals, where he emphasized meditation and the concept of internal force. Today, tai chi has spread worldwide and modern styles include: Chen, Yang, Wu, and Sun.

Present day, Tai Chi is practiced worldwide for its defense training and health benefits. Incorporating smooth, continuous, and slow movements, Tai Chi has been associated with improving balance, coordination, and muscle strength, with the added benefits of relieving pain and stiffness, especially from arthritis, and reducing the number of falls among mid-life and older adults (Chan et al., 2004; Maciaszek et al., 2007; Zhang
et al., 2006; Qin et al., 2005; Sherrington et al., 2008; Voukelatos et al., 2007; Gardner, Robertson, & Campbell, 2000).

**BACKGROUND**

*History and Development*

The Tai Chi for Health Programs was developed in 1997 by Dr. Paul Lam (Director) and a team of tai chi and medical experts in Australia. Dr. Paul Lam, a practicing family physician and tai chi master for over 30 years, realized the need for a specially designed program for people with arthritis. Having developed arthritis himself, Dr. Lam discovered the benefits tai chi had on his own chronic pain, and described tai chi as having changed his life and his pain management; as a result he wanted to convey his knowledge and expertise to millions of other people suffering like he once did. Since then, medical studies have confirmed Tai Chi as a safe and effective method to reduce pain and improve balance, coordination and strength (Voukelatos et al., 2007; Sherrington et al., 2008; Qin et al., 2005; Fuzhong et al., 2012; Maciaszek et al., 2007; Chan et al., 2004).

![Dr. Paul Lam – Originator and Director](Photo Credit: Tai Chi for Health Institute)
The first Tai Chi program developed by Dr. Lam and his team was in 1997, called *Tai Chi for Arthritis*. This 12 movement program is based on the *Sun* style of Tai Chi, a style known for its smooth, flowing movements which exclude the more physically vigorous crouching and leaping seen in other forms of Tai Chi. The footwork is unique in that when one foot advances, the other slowly follows, while the hand engages in slow, circular movements. Although each style of Tai Chi is unique, they all share the same essential principles. *Tai Chi for Arthritis* is easy to learn, with many individuals grasping the concepts within days, weeks, and at most several months. Additionally, tai chi is readily accessible, with many participants learning the core moves either through a class or video, and then practicing on their own schedule. Tai chi is especially suitable for older adults because its level of exertion can be adjusted for each individual, with all certified instructors trained to teach safely. Dr. Lam describes tai chi as a lifetime journey; it is an art with great depth. The *Tai Chi for Arthritis* has demonstrated its effectiveness; it has been adopted by the Arthritis Foundation of USA, and is supported by Arthritis Foundations around the world, including Arthritis Care of UK.

Following the success of *Tai Chi for Arthritis*, Dr. Lam and his team developed additional Tai Chi programs, including: *Tai Chi for Diabetes, Tai Chi for Beginners, Tai Chi for Back Pain, Tai Chi for Osteoporosis, Tai Chi at Work, Tai Chi 4 Kidz*, and *Qigong for Health*. Additionally, *Tai Chi for Fall Prevention* was developed and is based on the *Tai Chi for Arthritis* program with evidence to support that Tai Chi prevents falls, and improves balance and health. [Note: Tai Chi for Fall Prevention is a program but is essentially the Arthritis program]. In 2010, Dr. Lam and his team established the *Tai Chi
for Health Institute, with a mission: to empower people to improve their health and wellness using the Tai Chi for Health programs.

(Mission)

The primary focus of the Tai Chi for Health Institute is to train safely, effective instructors for Tai Chi programs, including Tai Chi for Arthritis and Tai Chi for Fall Prevention. Workshops are conducted worldwide and are led by various experts, including Dr. Lam. For a list of goals associated with each mission, refer to Appendix A.

Institute Mission:

1) Training effective and safe teachers of the Tai Chi for Health programs
2) Developing effective programs though research and development
3) Making the world aware of tai chi as a modality that promotes health

Tai Chi for Fall Prevention Program Principles

Dr. Lam describes that no matter what form of Tai Chi, if specific Tai Chi principles are incorporated into practice, the results will be better balance, coordination, and reduced falls. The principles are:

1) Movement control
Tai Chi movements are slow, smooth and continuous, that help strengthen internal muscles, in particular, the deep stabilizers that support and strengthen the spine. Tai Chi participants move against a gentle resistance to build full muscular strength. The slow and smooth movements calm the mind, helping to reduce falls resulting from sudden movements that lead to significant blood pressure drop. Additionally, improved flexibility and control allows for better blood and joint fluid circulation, reducing chronic pain associated with arthritis, osteoporosis, and other muscle/bone alignments.

2) *Weight transference*

Tai Chi participants are taught to be mindful of transferring weight with each step, which helps to improve mobility, coordination and balance. Additionally, the emphasis is placed on upright and supple posture, which further assists in strengthening muscle.

3) *Integration of mind and body*

Tai Chi is often described as an “internal art”, which emphasizes the integration and balance of the mind and body. Tai Chi participants are taught to focus, calm their minds, and loosen and relax their joints and ligaments. Research has indicated that confidence and control in movement results in reduced falls, especially among the elderly (Schmid, Van Puymbroeck, & Koceja, 2010; Oh et al., 2012; Song, et al., 2010). Studies have described that a fear of falling increases the risk (Logghe, et al., 2010; Boyd & Stevens, 2009; Murphy, Dubin,
& Gill, 2003), whereas tai chi aims to connect the mind and body, resulting in increased confidence of movements.

Consumers

According to a 2007 National Health Interview Survey conducted in the United States, over two million American adults had used Tai Chi in the past 12 months (Wang, 2011). People describe using Tai Chi for many reasons, including the benefits of a low-impact aerobic exercise; to improve muscle strength, coordination and physical alignments; to reduce chronic pain; to improve sleep; to meditate; and for overall well-being. The consumers range in age, socio-economic status, culture, education, physical disability, exercise level, among other differences. Tai Chi is an easy program to learn with the full benefit of being easily tailored to meet the needs of the participant. However, to receive full benefits it should be practiced for half an hour for at least four days a week. Furthermore, Dr. Lam recommends that participants should “shop around” for a class to determine the best type of style for them. Doing some research would increase the chances of full benefits and motivation to maintain practice. It has been shown that participants who practice for three months are more likely to adhere to practice regularly, while those who have been practicing for at least six months are more likely to incorporate Tai Chi in their lives over the long term.

Tai Chi programs have benefited many different types of individuals from all over the world. A young female, Judy\textsuperscript{16} who was beginning to practice Tai Chi found that she really noticed the benefits when she was pregnant for the first time. She reported feeling dizzy and losing her balance frequently. Judy began practicing Tai Chi regularly, and

\textsuperscript{16} Pseudo name
after a few weeks she noticed that her coordination had improved, her back pain decreased, and she was feeling mentally better. Another consumer, Sheila\textsuperscript{17} was an older adult who took up Tai Chi as a result of arthritis. She reported a lack of muscle strength, poor coordination, and chronic pain. She began practicing Tai Chi in her 70s and appreciated the fact that Tai Chi was easy to learn and was not demanding. Now, she is well into her 80s and is more active than she has ever been. Sheila practices Tai Chi regularly and has even taught some of her own classes in her community.

Tai Chi is a safe and effective way to improve balance, coordination, muscle strength, and various chronic pain. Tai Chi can be practiced by anyone—males and females, young and old, active and non-active. It can be practiced in a group or individually, at home or in a community setting. Tai Chi can be individualized to anyone who is willing to practice and integrate the mind, body and soul.

\textit{Primary, Secondary and Tertiary Prevention}

Tai Chi programs were developed as a result for a need to help with chronic pain associated with arthritis. Dr. Lam developed arthritis at a very young age and as a result he began to practice Tai Chi regularly. Fast forward twenty years, Dr. Lam noticed how much Tai Chi changed his life and he wanted to disseminate his knowledge and expertise of Tai Chi. Being a family physician himself who treated patients with arthritis, he would recommend Tai Chi as an alternative method. Patients began to describe how Tai Chi was helping them combat the effects of arthritis.

The Centers for Disease and Control (CDC) describes primary prevention as an act designed to prevent a disease, condition and/or injury from occurring in the first

\textsuperscript{17} Pseudo name
The Tai Chi for Fall Prevention Program educates participants about slip, trip and fall risk. Additionally, the Institute educates participants about the advantages of Tai Chi in the prevention of osteoporosis, arthritis and other age related illnesses.

Secondary prevention is described by CDC as an attempt to identify a disease, condition and/or injury at its earliest stage so that prompt and appropriate management can be initiated. Successful secondary prevention reduces the impact of the disease/injury. The Tai Chi for Fall Prevention program is based on the Tai Chi for Arthritis program, which targets individuals who have arthritis and would like to manage symptoms of stiffness, joint pain and other related arthritis symptoms. The greatest advantage of tai chi is that it is adaptable and multi-dimensional to any individual.

Tertiary prevention focuses on reducing and/or minimizing the consequences of disease, illness, and/or injury once it has been developed. The goal of tertiary prevention is to eliminate, or delay the onset of complications and disability due to disease. The Tai Chi for Health programs have been applied to patients with chronic pain and illness (Maciaszek et al., 2007; Song & Ahn, 2008), menopausal women (Chan et al., 2004), and patients with Parkinson’s disease (Fuzhong et al., 2012). Overall, it has been reported that participants show significant decreased symptoms related to their illness and pain, and increased quality of life.

Tai Chi programs were initially developed in order to help battle some of the effects of arthritis, but stakeholders quickly saw that Tai Chi not only helped those with arthritis, but also other physical and mental conditions. Now the goal of the program is to empower people to improve their overall health and well-being. It is no longer just about treating physical conditions, but increasing positive mentality and wellness before the
onset of a disease or disorder occurs. Dr. Lam describes Tai Chi as a primary prevention program, with the aim of targeting populations to educate them about the benefits of Tai Chi in the short and long-term.

**Stakeholders**

*Tai Chi for Health Institute* encompasses many different stakeholders that range from consumers, trainers, the governing board, health agencies across the globe, and research teams. First, the Tai Chi for Health programs are administered by a director and a governing board—chair, co-chair, treasurer, secretary and global representatives.

The governing body members are elected and are responsible in many aspects of the Institute, including governing the Institute and the programs, establishing policies and objectives, ensuring the programs are adhering to needs, financial and overall decision making. Majority of the members are master trainers and described as experts in the field of Tai Chi.

Second, the *Tai Chi for Health* programs rely on senior and master trainers to teach and to disseminate the knowledge of Tai Chi. There is only so much information that can be passed on from one person to another. Dr. Lam described that when he sees patients for arthritis, he is only engaging one-on-one—disseminating the information to one other person. The mission of the Institute could not be achieved without the dedication, motivation and passion of the trainers. For example, Dr. Lam teaches one trainer, who then goes on to teach two other trainers; those two trainers go on to teach four other trainers, and we can easily see how the circle of Tai Chi experts, training the trainers, is doubling at a rapid speed.
Master trainers are defined as multi-skilled and dedicated instructors authorized by Dr. Paul Lam to conduct instructor’s workshops in the *Tai Chi for Health* programs. While Senior trainers may conduct regional instructor practice sessions, assist and work with Master trainers in all matters relating to the *Tai Chi for Health* programs. All Trainers have a responsibility to adhere to a Code of Ethics (Appendix B) established by the governing board. There are now hundreds of certified trainers who have reached over five million people since the beginning of the initial program, *Tai Chi for Arthritis*.

Anyone can become a Master trainer (MT) or Senior Trainer (ST). However, becoming a MT or ST is strictly by invitation only. All trainers must be motivated and dedicated to engage in the Tai Chi principles while providing a safe and effective environment. All trainers are listed on-line at:

http://www.taichiforhealthinstitute.org/instructors/certified_instructors/

Master Trainers have a duty and obligation to make the complex art of Tai Chi simple and have the ability to communicate effectively. They must be dedicated to help others and the overall goal is to improve people’s health. MTs do not pay any franchise or license fees to the Institute. However, there is an annual membership fee.

“How becoming an MT is like practicing Tai Chi, when everything flows at the right time and rhythm, the right event will happen. The flow comes naturally when everything is right”

*How to Become a Master Trainer (MT):*

In order to become a certified Master Trainer (MT) by the *Tai Chi Health Institute*, there are several components. First and foremost, a Master Trainer candidate must be invited or nominated by a fellow MT, seconded by another, and finally approved
by at least half of the MTs in their country and by Dr. Lam. Master Trainer candidates must be leaders or instructors for at least one year, and must be an organizer or coordinator of at least two *Tai Chi for Arthritis* (TCA) or *Tai Chi for Health* (TCH) workshops. The candidate must know Parts I and II of TCA and be certified in both; candidates must also be CPR certified. Additionally, the candidate must be actively practicing Tai Chi at a high level and can effectively communicate with fellow Tai Chi instructors and students. Master Trainer candidates must commit to conduct instructor/leader workshops six times per year, but at least two workshops to maintain the qualification, which must be updated every two years. Most importantly, MT candidates must be passionate about using the TCA/TCH programs for improving people’s health.

Master Trainer candidates must be motivated and dedicated to study Tai Chi practices, as the learning material is extensive. They must be prepared to participate in MT workshops, which include a four-day face-to-face and a one-week “Exploring the Depth of Sun 73 Forms” workshops. Both workshops contain a comprehensive curriculum that includes in-depth knowledge of Tai Chi, teaching skill, how to effectively deliver the program to students, the knowledge of chronic conditions, and all other aspects of the TCA/TCH programs.

Once a Master Trainer is certified they are acknowledged and supported by the *Tai Chi for Health Institute*, their fellow MTs, and by Dr. Lam. They become certified instructor and leaders in the Tai Chi community. They are eligible to nominate and train Senior Trainers (STs) and nominate Master Trainer candidates. The greatest benefit of becoming a MT is you become part of a community of individuals who are dedicated to improve the lives and health of individuals through Tai Chi.
How to Become a Senior Trainer (ST):

In order to become a certified Senior Trainer (MT) by the Tai Chi for Health Institute, there are several components. First, a Senior Trainer candidate must be invited or nominated by a MT, seconded by another and finally approved by at least half of the MTs in their country and by Dr. Lam. Senior trainers must have organized at least one Tai Chi for Health workshop and be certified in Tai Chi for Arthritis, Part I and Part II. To qualify, a senior trainer candidate must have been a leader/instructor of Tai Chi for Health for at least one year, and know Sun Style at a reasonable level. It is preferred that senior trainer candidates have instructor certificates in Tai Chi for Diabetes and Tai Chi for Back Pain. Senior trainers must be prepared and dedicated to assist master trainers in organizing and/or conducting workshops during their training. They must have good communication and teaching skill, and have a willingness and compassion to promote Tai Chi for Health to improve quality of life. They should be available to upgrade their skills at regular intervals every three months.

Senior trainers must be dedicated to arrange and conduct regional gatherings, assist MTs and contribute to Tai Chi for Health programs. The tenure will last two years, with the requirement that every two years, the nominating MT will be responsible to assess if the ST has been effective in communicating the practice of Tai Chi.

Accreditation and Partnerships

Tai Chi for Health programs have partnered with organizations worldwide and have been accredited by many regulatory bodies.
In the United States, *Tai Chi for Health* has been accredited by: American College of Sports Medicine, American Council on Exercise, Indiana Professional Licensing Agency, Kansas State Board of Nursing, Kansas Physical Therapy Association, Board of Certification, Inc (for Certified Athletic Trainers), and Florida Board of Nursing. Additionally, *Tai Chi for Health* has a partnership with Arthritis Foundation USA.

Internationally, *Tai Chi for Health* has been accredited by Fitness Australia, Physical Activity Australia, and Korean Nurses Association. Additionally, *Tai Chi for Health* has been internationally partnered with Arthritis Australia, Diabetes Australia, Osteoporosis Australia, Better Health Tai Chi Chuan (Australia), Arthritis Care UK, Accident Compensation Corporation (New Zealand), and Tai Chi for Health Education and Research Center (Korea).

Furthermore, *Tai Chi for Health* has been recommended by the Center of Disease Control and Prevention (USA) and the Administration on Aging (USA) (Administration on Aging, 2012).
The Pilot Project

Tai Chi was developed as a “dream”. Dr. Lam had a vision of spreading the Tai Chi art to empower people and to improve physical and mental wellness. The project began with three experts: Tai Chi and medical expert, Dr. Paul Lam; a researcher and a physiotherapist. There was a need for Tai Chi as an easy to learn, low-bearing exercise, and effective program to treat chronic pain. Dr. Paul Lam began a pilot project of instructional videos that were sent to patients. Patients were asked to comment on the videos and the impact it has contributed on their health. Based on the feedback from patients, the instructional videos were changed to meet the needs of the patients. There was no funding provided to Dr. Lam to begin his project. He did not receive any governmental or research support. After the initial pilot project, Dr. Lam began to sell his instructional videos and a research team was involved to indicate the effectiveness of the videos. At this point, health agencies worldwide began to invest in Dr. Lam’s “dream”. Partnerships were established with Arthritis Foundation’s in the USA and in Australia. Now, the Tai Chi for Health Institute is supported by the Arthritis Foundation and many health agencies around the world.

Nonprofit Institute

The Tai Chi for Health Institute has been established as a legal nonprofit organization under New South Wales State. Within the last two years, Tai Chi for Health Institute has been established as an institute fully chaired by a group of members. The constitution dictates that the board has total control of the Institute, with members of the
board being voted members by all current Master and Older adults Trainers. All members are required to pay a membership fee that helps fund the costs for administration of the Institute. As part of the financial arrangement governed by New South Wales law for nonprofit organizations, the institution is classified as a “transparent operation”—financial statements, monthly meeting notes, decisions made, etc., must be readily available online.

**Governing Board Members**

The Tai Chi for Health Institute is governed by elected board members consisting of a director and governing board—chair, co-chair, treasurer, secretary and global representatives.

<table>
<thead>
<tr>
<th>Tai Chi for Health Institute Governing Body:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(as of 2014)</td>
</tr>
<tr>
<td>Director: Dr. Paul Lam</td>
</tr>
<tr>
<td>Chair: Raymond Tang Ching Lau</td>
</tr>
<tr>
<td>Vice Chair: Carolyn Hotchkiss</td>
</tr>
<tr>
<td>Treasurer: Mark Hoyle</td>
</tr>
<tr>
<td>Secretary: Margaret Brade</td>
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<tr>
<td>Marty Kidder</td>
</tr>
<tr>
<td>Rani Hughes</td>
</tr>
<tr>
<td>Shelia Rae</td>
</tr>
<tr>
<td>Jocelyn Simpson</td>
</tr>
<tr>
<td>Philomena Kaarma</td>
</tr>
<tr>
<td>Chief Operational Officer: Anna Bennett</td>
</tr>
</tbody>
</table>

The governing body members are elected and voted to the governing body. Members are responsible in many aspects of the Institute including, governing the
Institute and the programs, establishing policies and objectives, ensuring the programs are adhering to needs, financial and overall decision making.

**Premier Membership for Certified Instructors**

Current certified instructors in the *Tai Chi for Health Institute* can become *Premier Members* of the institute. To qualify, you must be currently certified as an instructor and pay an annual fee of $30.00 (Australian Dollars). Added benefits include: full page instructor profile on the *Tai Chi for Health Institute* website; use of the *Tai Chi for Health* logo under policy; prime instructor listing on website; access to members only section of the website; advance notice of upcoming workshops; monthly newsletter; administrative support; and discounts for Tai Chi productions.

**Cost for Consumers and Members**

The cost of instructional videos and books range in price from $10 to $50, with some resources available at no cost. Participant classes are taught worldwide in different settings, including, health agencies, community agencies, fitness centers, and academic facilities. Some classes are offered free of charge, while others may have a cost – depending on the agency.

Master trainers and Senior trainers do not pay any licensing or franchise fees, instead the mission of the Institute is “dedication to the people”.
IMPLEMENTATION

Tai Chi for Fall Prevention works to improve balance, confidence and muscular strength. The program has been implemented and evaluated worldwide. There are various types of Tai Chi, however, Sun-Style Tai Chi has been specifically designed for arthritis and fall prevention; promoting balance, control, flexibility and bone health. Tai Chi training over 8–16 weeks has shown to improve balance, flexibility and reduce the number of falls. Typically, a Tai Chi class includes 10 minutes of warming up, 40–45 minutes of Tai Chi, and 5–10 minutes of cooling down. It is highly encouraged to supplement practicing tai chi at home every day for at least 20 minutes.

Additionally, Dr. Lam offers instructional DVDs, CDs and books to teach Tai Chi. Dr. Lam travels globally with the Tai Chi for Health Institute to offer master classes to teach instructors how to effectively implement Tai Chi for health benefits.

Essential Principles for Injury Prevention

If practiced regularly and safely, the benefits of Tai Chi are immense for improving health and inner energy. There are a few guiding main principles to practice Tai Chi effectively, and participants may use a video camera, mirror, or check with friend or instructor to make sure the principles are followed correctly.

1. Practice the movements slowly, without stopping. Make them continuous, and refrain from jerking. It is recommended to maintain the same speed throughout your practice.

2. Imagine moving against resistance.
3. Be conscious of weight transference. This is crucial for improving mobility, coordination and stability. Be aware when you transfer your weight and be aware of each step of your weight transference.

4. Maintain an upright posture and body alignment. Keep your body well aligned in a straight line without undue tension. This is especially critical when moving stances, and especially when you start bending your knees as the body alignment can be distorted.

5. Loosen the joints. You should be relaxed when you do Tai Chi, but be cautious of “floppy muscles”. You want to be in control of your movements but in a relaxed manner.

6. Focus on your movements. Avoid distraction and focus on what you are doing. Be aware of all the principles mentioned above, but think of them one at a time.

**Side Effects and Risks**

Tai Chi is a relatively safe practice. However, there are some cautions that must be practiced. As with any exercise program, you have to be able to pace and not exert yourself. Going at a pace that you are comfortable with is crucial. Participants are encouraged to move at a pace that feels calming and relaxing. Overdoing practice can also cause an impact. For example, overdoing practice can cause sore muscles, sprains, various degrees of pain.

A secondary precaution is that participants do not practice Tai Chi after a meal. Tai Chi instructors often recommend not practicing Tai Chi when you are full after
eating, tired, or have an active infection. In order to effectively practice Tai Chi you must be physically and mentally present.

A third precaution is for participants not to practice when they are pregnant or are injured. For example, hernia, joint problems, back pain, fractures, or severe osteoporosis can cause further injury. It is recommended that participants consult with their health care provider to determine the right type of exercise for their condition. If Tai Chi is recommended by a health care practitioner, participants may be advised to modify or avoid certain techniques and positions in Tai Chi.

**Examples of common Tai Chi stances**

(Materials reprinted from Wolf, Coogler, & Xu; 1997)
OUTCOME

The largest fall prevention study published was based on Dr. Lam’s *Tai Chi for Fall Prevention* (Voukelatos et al, 2007). As a result, a global training program was developed and implemented worldwide as an effective and safe program. It is listed by the Centers for Disease and Control (CDC) as one of the three programs for fall prevention. Song et al. (2010) found that participants had greater knee extensor and bone density, as well as a decrease in a fear of falling (mean age of intervention group = 61, and mean age of control group = 61).

*Gentle yet effective Exercise for Fall Prevention*

There has been some criticism that Tai Chi is too gentle of an exercise to have significant effects on preventing slips, trips and falls. However, Tai Chi is a type of exercise that is gentle and graceful, yet builds power and internal strength. Participants are taught to be in control of every muscle and every movement through gentle and conscious movements. Participants must be in control of their stability, balance, and transitioning movements—skills that requires practice. Many researchers studying falls, examine the fear of falling as a cofounding factor. Several studies have indicated that fear of falling results in increased falls (Delbaere, et al., 2010; Friedman, et al., 2002). Tai Chi aims to improve balance by strengthening muscles and coordination, while strengthening the mind and increasing confidence of not falling. Thus, Tai Chi aims to improve both the physical and mental states.
Tai Chi Promotion for Injury Prevention

On February 15, 2013, Margaret Kaniewski, a Public Health Advisory with the National Center for Injury Prevention and Control of CDC, wrote to Dr. Lam:

“Attached is a CDC guideline being promoted for Tai Chi as an exercise form to prevent falls among older adults. We are promoting your Tai Chi programs since you have established manuals and instructor trainings nationwide. I wanted to let you know we are sharing this with our partners.”

Tai Chi for Fall Prevention has been promoted and is actively recognized as an approved fall prevention program worldwide (Centers for Disease Control and Prevention, 2013). It has been demonstrated that the practice of Tai Chi improves many components of health, including, but not limited to, preventing falls and improving health and the quality of life. Additionally, it may prevent and/or improve the management of chronic diseases, including arthritis and osteoporosis.

Evidence Based Approach

The Tai Chi for Arthritis and Fall Prevention programs are based on established manuals and consistent instructor training world-wide. Additionally, the programs follow an evidence-based approach in reducing falls and improving quality of life. In 2001, the world’s largest fall prevention study in a community setting was conducted in Sydney, Australia (Voukelatos, et al., 2007). A randomized and controlled study of 702 participants aged 60 and older were taught Tai Chi for Arthritis for 16 weeks. Balance was measured at baseline and follow-up. Researchers concluded that falls were reduced by nearly 70%. Additionally, it was found that building confidence correlated closely to
the reduced rate of falling. Since publication in 2007, this study has been listed on the Centers for Disease and Control (CDC) official site as evidence of the effectiveness of Tai Chi in preventing falls.

Following the successful evidence of *Tai Chi for Arthritis* in Australia, researchers at the University of North Carolina, School of Medicine conducted a randomized controlled study testing the efficacy of the Arthritis Foundation’s Tai Chi program (Callahan, et al., 2010). Three hundred and fifty-four participants were randomly assigned to two groups, with the intervention group receiving an 8–week, twice weekly Tai Chi course. Results indicated that following the Tai Chi intervention, participants showed moderate improvements in pain, fatigue, and stiffness. Additionally, participants reported an increased sense of well-being and had improved reach or balance.

The New South Wales Health Department has funded many *Tai Chi for Fall Prevention* programs. In the town of Ford, the department funded Tai Chi for 20% of the population over two years. A program evaluation concluded that 99% of the participants had improved balance, flexibility and improved strength. In addition to the New South Wales Health Department, the Aged Care Department in Victoria, the South Australia Health Department, and Sport and Creation Department have funded training for the *Tai Chi for Arthritis* program.

In early 2000s, the Accident Compensation Corporation (ACC) in New Zealand, a national government body that has a no-fault policy and compensates all injuries and injuries in the country, realized the benefits of Tai Chi on injury prevention. Their medical experts recommended using Tai Chi, among other exercises, to prevent falls. The ACC worked with Dr. Lam to install a training program that included safety and quality
control. Within a year, the *Tai Chi for Arthritis* program was adopted as the less complex and easier form to learn. A training manual is available at:


Since the ACC has adapted the program, positive results have been obtained and since 2009, 80% of the ACCs 700 trained instructors have been using the *Tai Chi for Arthritis* program, and delivering Tai Chi safely to over 35,000 people.

*Tai Chi for Arthritis* program has been specifically developed to reduce the symptoms and improve the physical functioning of arthritic patients. A randomized and controlled study by Song, et al. (2003) examined the changes in symptoms and physical characteristics in women with osteoarthritis. Seventy-two female patients (mean age = 63 years old) were randomly assigned into 2 groups, with the experimental group receiving a 12-week Tai Chi exercise program. Results indicated that the Tai Chi group perceived significantly less pain and stiffness in their joints, and reported fewer perceived difficulties in physical functioning. Additionally, in the physical fitness test, there were significant improvements in balance and abdominal muscle strength. Previous studies have identified that controlling balance is central in preventing falls and injuries (Sherrington et al., 2008; Qin et al., 2005; Zhang et al., 2006; Fuzhong et al., 2012; Maciaszek et al., 2007).

A Cochrane Review (2009) was conducted and included 111 randomized trials, involving over 55,000 participants. Measures for fall prevention included group exercise, Tai Chi, home-based individual exercise, vitamin D, home safety measures, anti-slip shoes, psychotropic medications, pacemakers, and eye cataract surgery. Of all the
measures, exercise produced significant decreases in falls, particularly Tai Chi (Gillespie, et al., 2009).

Thornton, Sykes and Tang (2004) found that Tai Chi had changes in balance and vascular responses for a community sample of mid-life women. Seventeen healthy, normotensive, sedentary women aged 33–55 were recruited into a 12-week Tai Chi exercise programme, in which they participated three times per week. A control group was matched. Results indicated that balance was significantly improved following Tai Chi, with significant decreases in blood pressure. Researchers concluded that Tai Chi has benefits on overall health among mid-life women.

**Why Tai Chi Works**

Tai Chi for Health has many benefits in reducing falls and improving quality of life. First, it consists of a high standard and consistent training of instructors. One of the primary components of the Tai Chi for Health Institute is that instructors participate in ongoing learning. They are responsible to attend workshops on a regular basis as well as participate in teaching of Tai Chi. Additionally, trainers are required to be updated every two years, and they must be available to provide support and mentorship to the individuals they have trained.

Secondly, Tai Chi incorporates a progressive stepwise teaching method that simplifies and enhances the student’s ability to learn. The teaching method encourages students through specific positive feedback and minimal corrections, resulting in enhanced enjoyment of the practice. Students are encouraged to implement Tai Chi principles into everyday life, connecting the mind, body and soul.
Lastly, Tai Chi principles are gentle, smooth and can be accommodated to various levels of strength. Participants are encouraged to take control of their movements, and become consciously aware of how their mind and body is connected. Tai Chi is not about reaching a maximum goal through competition, instead it is meant to focus on individual strength. Participants are encouraged to move at their own pace and practice movements they feel comfortable with.

The U.S. National Center for Complementary and Alternative Medicine (2013) suggests that individuals practice Tai Chi for a variety of health-related purposes, including: benefits associated with low-impact, weight-bearing exercise; improvements in physical condition, muscle strength, coordination and flexibility; improvements in balance and decrease risk for falls; easing of pain and stiffness; improvements to sleep; and for overall wellness.

Tai Chi has been associated with improvements in psychological well-being, including reduced stress, anxiety, depression, and increased self-esteem (Wang, et al., 2010; Jimenz, Melendez & Albers, 2012). A meta-analysis was conducted in eastern and western populations (Wang, et al., 2010). Randomized controlled trials, non-randomized controlled studies, and observational studies reporting at least one psychological health outcome were examined. Forty studies with over 3,800 subjects were identified. Overall results indicated a positive association with decreased stress, anxiety, depression and increased self-esteem. Tai Chi was positively associated with improved stress levels in healthy adults, patients with HIV-related distress and elderly individuals with cardiovascular disease. Tai Chi was associated with improvements in symptoms and physical function in patients with arthritis and multiple sclerosis, as well as
improvements in immune response. Additionally, evidence suggested short- and long-term Tai Chi practice had favorable effects on mood among healthy adults, elderly adults with cardiovascular risk factors, obese women, and adolescents with attention deficit hyperactivity disorder.

In 2007, Arthritis Care and Research published one of the largest studies about the practice of Tai Chi by people with arthritis (Fransen, et al., 2007). The researchers found that the Tai Chi for Arthritis program not only reduced pain, but also improved quality of life. The Arthritis Foundation continues to support Tai Chi for Health as an exemplary program in reducing pain and managing symptoms of arthritis.

Overall, research has indicated that Tai Chi for Health program have been effective in increasing balance (Sherrington, et al., 2008, Li, Hong, & Chan, 2001), muscle strength (Qin et al., 2005), coordination (Fuzhong et al., 2012), decreasing symptoms associated with chronic pain, such as arthritis and osteoporosis (Maciaszek et al., 2007), and increasing psychological well-being (Jimenez, Melendez, & Albers, 2012). If practiced effectively, safely and regularly, Tai Chi is an exemplary model of fall prevention throughout mid-life and later life.

**The Status of Tai Chi Program Implementation and Research**

The Centers for Disease Control and Prevention (CDC) has listed Tai Chi as an effective, evidence-based exercise program as part of their compendium on fall prevention (Stevens, 2010). Tai Chi has been shown to be an effective and easy to learn exercise that targets balance, muscle strength and overall coordination. Tai Chi is being implemented for fall prevention, chronic pain, and other illnesses/disorders associated
with natural aging. Centers like CDC, Arthritis Foundation and Physical Rehabilitation organizations around the world are implementing Tai Chi as part of their curriculum for healthy living.

Scientific research on the health benefits of Tai Chi is ongoing. Several studies have focused on the elderly, including Tai Chi’s potential for preventing falls and improving cardiovascular fitness and overall healthy well-being. In general, studies of Tai Chi have been small, or they have had design limitations that may limit their conclusions. Further research is needed in order to determine long-term effects of Tai Chi. Furthermore, additional research is required in examining the core principles involved in Tai Chi that prevent slips, trips and falls.

CONCLUSION

Tai Chi has been identified as a safe and effective exercise program to improve balance, confidence and muscular strength. Additionally, Tai Chi has been implemented and evaluated worldwide. The Tai Chi for Health Institute incorporates the Sun style of Tai Chi in order to prevent falls, manage arthritis and chronic pain, and promote a healthy living. Tai Chi for Fall Prevention by the Tai Chi for Health Institute is guided by three main principles: weight transference, movement control, and integration of mind and body. The easy to learn Sun style is easy to learn, can be conducted individually or in a group, and individualized to the needs of each participant promotes balance, control, flexibility, and bone health. Tai Chi is gentle yet powerful, as participants require being in control of their stability, balance and movement—skills that require practice and are
necessary in fall prevention. The Centers for Disease Control and Prevention include Tai Chi as a model exercise for fall prevention (Stevens, 2010). Additionally, the Arthritis Foundation, the Accident Compensation Corporation, National Center for Complementary and Alternative Medicine, among others, recommend Tai Chi in order to prevent injury, manage pain, and promote healthy living.
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1. Training Effective and Safe Teachers

1.1 Certify instructors and updates
   - Goal: Establish and revise criteria for selection of instructors
   - Goal: Establish and revise training curriculum for new instructors
   - Goal: Establish and revise criteria for maintenance of instructor status

1.2 Develop and Coordinate Senior Trainer Certification Programs
   - Goal: Establish and revise criteria for selection of Senior Trainers
   - Goal: Establish and revise training curriculum for new Senior Trainers
   - Goal: Establish and revise criteria for maintenance of Senior Trainers status

1.3 Develop and execute Master Trainer certification programs
   - Goal: Establish and revise criteria for selection of Master Trainers
   - Goal: Establish and revise training curriculum for new Master Trainers
   - Goal: Establish and revise criteria for maintenance of Master Trainer status

2. Developing effective programs through research and development

2.1 Modify existing programs as needed and create new ones as the need arises

2.2 Provide support to Master Trainers/Senior Trainers /instructors

2.3 Serve as consultant for proposed research projects

2.4 Develop collaborative projects with universities and other research investigators

2.5 Provide leadership for targeted clinical research in fall prevention, arthritis, diabetes, osteoporosis, health challenges for kids, etc.

3. Making the world aware of tai chi as a modality that promotes health

3.1 Collaborate with other organizations such as the Arthritis Foundation.
3.2 Serve as a resource for health policymakers, academics, and development practitioners including journalists, teachers, youth and civic leaders.

3.3 Target universities, key organizations and work sites for instructor workshops

3.4 Obtain accreditation for CEUs for instructors taking the workshops
DR PAUL LAM TAI CHI FOR HEALTH INSTITUTE Incorporated
Also known as the TAI CHI FOR HEALTH INSTITUTE
Dedicated to improving the quality of life of people globally through Tai Chi for Health programs
Code of Ethics for Instructors and Leaders
Preamble

DR PAUL LAM TAI CHI FOR HEALTH INSTITUTE is an educational, scientific, and professional organization whose certified instructors include Master Trainers, Senior Trainers, instructors and leaders of Dr. Paul Lam’s Tai Chi for Health programs (hereafter Tai Chi for Health programs). The Institute’s certified instructors are dedicated to the enhancement of the quality of life of all who participate in a Tai Chi for Health program. Instructors and leaders embrace a cross cultural approach in support of the worth, dignity, potential, and uniqueness of all people. Professional ethics are an essential part of the mission of the Institute: state mission. The code of ethics presented here serve to guide instructors’ and leaders’ behavior and encourage them to seek excellence in their tai chi and teaching. In this way this code of ethics not only supports, but strengthens the Institute's mission.

1. Introduction
DR. PAUL LAM TAI CHI FOR HEALTH INSTITUTE (hereafter TCHI) seeks to inform, teach and encourage people around the world to understand and appreciate the positive life style benefits that Tai Chi for Health programs offer.

This code of ethics offers guidance for instructors and leaders of Tai Chi for Health programs and provides a core of foundational principles underlying the safe and effective tai chi programs they were trained to teach. All qualified instructors and leaders of Tai Chi for Health programs are expected to accept and uphold these standards of practice. This code is presented as follows:

1. Introduction;
2. Purposes of the code of ethics;
3. Standards of practice;
4. Responsibility to students;
5. Responsibility to colleagues;
6. Responsibility to TCHI; and
7. Professional integrity;
8. Review.
9. Addendum: Glossary of Terms

2. Purposes of this Code of Ethics for Instructors and Leaders
The purposes of the following standards of practice are to:
2.1 Guide TCHI members to ensure that:
1. Their instruction is safe and effective and
2. Participants are treated with dignity and respect
2.2 Maintain a common base of standards for the safe and effective teaching and practicing of Tai Chi for Health programs.
2.3 Enhance the unity of the conduct of TCHI members.

3. Standards of Practice
TCHI members who are instructors and leaders take personal responsibility for ensuring that their conduct adheres to the high standards established in global health communities. The universal standards of “first do no harm” and “all persons are treated with dignity and respect” are paramount in the practice of teaching and are specifically incorporated into these standards; and in addition instructors and leaders take steps to meet the standards of practice set by the Institute.

4. Responsibility to the Participants of Tai Chi for Health Programs
In maintaining standards TCHI members who teach tai chi for health classes shall:
4.1 Prepare and teach their tai chi for health classes within the guidelines of the safe and effective teaching system they have been trained to use.
4.2 Continue their personal development as a means to maintain and improve skills, knowledge and professional conduct.
4.3 Monitor and encourage all participants to stay within their “comfort zone.”
4.4 Respect participants' right to safety by avoiding physical contact
4.5 Treat all participants equally, avoiding favoritism or the appearance of favoritism
4.6 Respect participants' diversity in all respects
4.7 Respect personal and confidential information disclosed by participants.
4.8 Be aware of the limits of their skills, experience and knowledge.
4.9 Consult with mentors and knowledgeable professionals when such consultations are needed.
4.10 Refer participants to their health professional when asked about health concerns by the participant
5. Responsibility to Colleagues
TCHI instructors and leaders take responsibility for treating colleagues with respect. As a colleague a TCHI instructor will:
5.1 Speak positively and kindly of other instructors.
5.2 Respect personal boundaries and established relationships between instructors and their students. Offer guidance to a colleague if asked, especially by one who is less experienced.
5.3 Provide accurate descriptions of their certifications and related qualifications.
5.4 Provide honesty in all advertising and promotional materials.
5.5 Participate proactively in opportunities of collaborating with colleagues to promote the TCHI and Tai Chi for health programs.

6. Responsibility to TCHI
As a member of TCHI, instructors and leaders support the growth and development of the Institute by:
6.1 Maintaining their membership
6.2 Updating their certifications as appropriate
6.3 Contributing to the Institute such as serving on a committee
6.3 Responding to requests for time and talent
6.4 Recruiting new members to the organization.
6.5 Participating in TCHI sponsored events

7. Professional Integrity:
TCHI instructors and leaders represent the Institute in a professional manner by:
7.1 Describing themselves as tai chi for health instructors and leaders in an honest and accurate way in all respects
7.2 Presenting a positive image to their community
7.3 Supporting the goals and positive intentions of the TCHI

8. Review:
TCHI is committed to reviewing this Code in the light of experience and on a regular basis with the aim of improving both the process and the outcomes from it. The Code is to be reviewed at least every two years and also in the light of experience, best practice or significant change. All aspects of this Code shall be open to review at any time.
This document is dated February 21, 2010. This Document shall stay in force until any modifications are formally agreed to by TCHI and a new version issued.
ADDENDUM:
Glossary of Terms
Code of Ethics: Standards of conduct established by an organization representing professions that apply to individuals in their professional capacity.
Cross-cultural approach: Based on the golden rule of treating everyone with dignity and respect, instructors and leaders strive for cross cultural understanding in an effort to provide safe and effective Tai Chi for Health programs globally.
Diversity: Conscious practices that involve: Respecting the views and beliefs of others in regard to gender, ethnic origins, religion, culture, sexuality, lifestyle, age and social status.
Instructors and Leaders: Persons trained and certified to teach Tai Chi for Health programs. The titles hold equal status.
Professional Integrity: Quality characterized by honesty, reliability, and fairness
Responsibility: A legal and moral duty to use one's knowledge in order to benefit participants of Tai Chi for Health programs in ways that benefit them and society at-large
Standards of Practice: A minimum level of performance one is required to demonstrate in the achievement of a specific task or skill.
Section Three:

ADVISORY COMMUNITY OF PRACTICE DIRECTORY

Mid-life Falls Prevention Advisory Community of Practice Directory, July, 2014

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