Université de Montréal

Confiance en son équilibre et équilibre perçu chez les aînés: conceptualisation, mesure et impact d'un programme communautaire de prévention des chutes

par

Johanne Filiatrault

Département de médecine sociale et préventive
Faculté de médecine

Thèse présentée à la Faculté des études supérieures
en vue de l'obtention du grade de Philosophiae Doctor (Ph.D.)
en santé publique
option promotion de la santé

Février, 2008

Université de Montréal

Faculté des études supérieures

Cette thèse intitulée :

Confiance en son équilibre et équilibre perçu chez les aînés: conceptualisation, mesure et impact d'un programme communautaire de prévention des chutes

présentée par :

Johanne Filiatrault

a été évaluée par un jury composé des personnes suivantes :

Jean-Marc Brodeur
président-rapporteur

Lucie Richard
directrice de recherche

Lise Gauvin
codirectrice

Cara Tannenbaum
membre du jury

Jean Vézina
examinateur externe

Francine Ducharme
représentante du doyen de la FES

RÉSUMÉ

Les chutes chez les aînés constituent un problème prioritaire de santé publique étant donné leur incidence élevée dans cette population et leur impact sur la santé et la qualité de vie des aînés. Une variété d'interventions ont été élaborées dans le but d'agir en amont de ce problème. Les stratégies déployées sont nombreuses et ciblent une variété de facteurs de risque, tels l'altération de l'équilibre avec l'âge et/ou l'apparition de certaines maladies, de même que certains facteurs de risque propres aux comportements des aînés et à leur environnement. Des écrits récents suggèrent que des facteurs psychologiques tels que la peur de chuter, la confiance en son équilibre et le sentiment d'efficacité relative aux chutes (traduction française de l'expression *falls efficacy*) sont associés à la vulnérabilité des aînés face aux chutes et devraient conséquemment faire l'objet d'interventions. Toutefois, peu de données sont disponibles quant aux effets des interventions de prévention des chutes sur ces facteurs. Cette thèse a été réalisée en ayant recours à des données préalablement colligées dans le cadre d'un projet de recherche plus large mené par Robitaille et collaborateurs (2005) à la Direction de santé publique de Montréal. L'un des principaux buts de ce projet d'envergure était d'évaluer l'impact du programme PIED (Programme intégré d'équilibre dynamique) sur l'équilibre des aînés lorsque celui-ci est offert dans des conditions naturelles d'implantation par des organismes communautaires. De façon complémentaire, la thèse vise à établir le potentiel des programmes communautaires de prévention des chutes (plus spécifiquement ceux comprenant des composantes d'exercices d'équilibre et d'éducation offertes en groupe) pour

agir sur les facteurs psychologiques associés aux chutes chez les aînés. Rédigée sous forme d'articles, la thèse propose deux objectifs spécifiques: 1) étudier les propriétés psychométriques d'une version simplifiée d'un instrument de mesure conçu pour évaluer la confiance des aînés en leur équilibre (l'échelle ABC-S, ou son appellation anglaise, *Activities-specific Balance Confidence (ABC)-Simplified Scale*); et 2) évaluer les effets du programme PIED sur deux facteurs psychologiques associés aux chutes, soit la confiance en son équilibre et l'équilibre perçu. La thèse inclut également deux autres articles pertinents à la démarche de recherche entreprise, soit : 1) une revue systématique des études relatives à l'impact d'un éventail d'interventions préventives sur les facteurs psychologiques associés aux chutes chez des aînés vivant à domicile; 2) une description détaillée du programme PIED incluant les résultats d'une analyse de la faisabilité de son implantation par les organismes du milieu communautaire. D'une durée de 12 semaines, le programme PIED comprend des exercices d'équilibre et un volet éducatif offerts en groupe à des aînés autonomes ayant fait une chute ou étant préoccupés par leur équilibre ou par les chutes. Le projet doctoral, de même que l'investigation à laquelle il est lié, ont eu recours à un devis de recherche quasi-expérimental de type pré-post avec groupe témoin. Des représentants des milieux communautaires ont recrutés 98 aînés pour participer au groupe expérimental et 102 aînés pour participer au groupe témoin. Des données sur un ensemble de variables, dont la confiance en son équilibre (mesurée à l'aide de l'échelle ABC-S) et l'équilibre perçu, ont été collectées lors d'entrevues menées en face à face. Des tests d'équilibre ont également été administrés par des physiothérapeutes. Les données colligées à l'entrée dans l'étude et au post-test ont été utilisées pour le projet de thèse. L'étude psychométrique révèle que

l'échelle ABC-S présente une bonne consistance interne, une bonne validité concomitante avec les scores obtenus aux épreuves d'équilibre, de même qu'avec l'équilibre perçu, l'histoire de chutes et la peur de chuter. Les résultats de l'étude évaluative montrent que le programme PIED est non seulement bénéfique pour l'équilibre des participants, mais qu'il contribue également à améliorer l'équilibre perçu. Toutefois, aucun impact sur la confiance des aînés en leur équilibre n'a été observé suite à la participation au programme. En conclusion, il appert que les aînés sont aptes à reconnaître une amélioration dans leur équilibre à la suite d'un programme de prévention des chutes comme le programme PIED mais que ce bénéfice ne s'accompagne pas d'une confiance accrue des participants en leur équilibre. Ces résultats indiquent qu'un changement dans la confiance en son équilibre nécessite une action sur des facteurs autres que l'équilibre. D'autres études s'avèrent nécessaires afin d'identifier les ingrédients spécifiques qui sont requis pour qu'une intervention telle que PIED puisse procurer le maximum de bienfaits aux aînés, tant sur les plans physique que psychologique.

Mots clés : Prévention des chutes, facteurs psychologiques associés aux chutes, peur de chuter, confiance en son équilibre, équilibre perçu, évaluation de programme, intervention communautaire, aînés.

SUMMARY

Falls among the elderly represent a critical public health issue because falls occur frequently among this population and they have serious consequences on seniors' health and quality of life. A variety of interventions have been developed to prevent the occurrence of falls using strategies targeting a diversity of falls risk factors including balance decline associated with aging and/or disease as well as environmental and behavioural falls risk factors. More recently, falls prevention researchers have suggested that falls-related psychological factors such as fear of falling, balance confidence, and falls efficacy should be targeted as valued outcomes in and of themselves because there is evidence that these factors are associated with seniors' vulnerability to falls. However, limited data are available regarding the impact of falls prevention interventions on these factors. This thesis involved the mining of existing data collected within the context of a larger investigation lead by Robitaille and colleagues (2005) at the Montreal Public Health Department. One of the main goals of this larger investigation was to assess the impact of a falls prevention program called *Stand Up!* on seniors' balance, when the program is offered under the natural conditions of community-based organizations. In a complementary way, this thesis aims to establish the potential of community-based falls prevention programs (more specifically those including balance exercises and educational components offered in groups) in influencing falls-related psychological factors among seniors. Written in the form of a series of papers, this thesis has two specific objectives, namely to: 1) examine the psychometric properties of a simplified version of a questionnaire developed to assess balance confidence among elderly (the ABC-S or *Activities-specific*

Balance Confidence (ABC)-Simplified Scale); and 2) examine the impact of *Stand Up!* on two falls-related psychological factors, namely balance confidence and perceived balance. The thesis also includes two other papers relevant to the research topic, namely: 1) a paper involving a systematic review of studies that have examined the impact of several preventive interventions on falls-related psychological factors; and 2) a second paper including a detailed description of *Stand Up!* and reporting the results of an analysis of the feasibility of implementing the program in community-based organizations. *Stand Up!* is a 12-week program that includes balance exercises and an educational component offered in a group format to independent seniors who have fallen or are concerned about their balance or falling. The doctoral project, as well as the main study to which it is linked, used a quasi-experimental pre-post design with a control group. Representatives of community-based organizations recruited 98 seniors to participate in the experimental group and 102 seniors to take part of the control group. Face-to-face interviews allowed for data collection on a series of variables, namely balance confidence (measured with the ABC-S Scale) and perceived balance. Balance performance tests were also administered by physical therapists. Data collected at baseline and post-test were used for this thesis. The psychometric study shows that the ABC-S scale has good internal consistency as well as a good convergent validity with scores obtained on balance tests, perceived balance, falls history, and fear of falling. The evaluative study show that a program that improve balance performance such as *Stand Up!* can also improve perceived balance. However, the program did not have an impact on participants' balance confidence. In conclusion, it appears that seniors are able to recognize an improvement in their balance following a falls prevention program such as

Stand Up!. However, this impact on perceived balance was not accompanied by a similar increase in participants' balance confidence. These findings indicate that a change in balance confidence likely requires actions on factors other than balance. Further studies are warranted to identify those critical ingredients that might allow *Stand Up!* to achieve the maximal benefits for seniors, both physically and psychologically.

Key words: Falls prevention, falls-related psychological factors, fear of falling, balance confidence, perceived balance, program evaluation, community intervention, seniors.

TABLE DES MATIÈRES

LISTE DES TABLEAUX

CHAPITRE 6 - EVIDENCE OF THE PSYCHOMETRIC QUALITIES OF A SIMPLIFIED VERSION OF THE ACTIVITIES-SPECIFIC BALANCE CONFIDENCE SCALE FOR COMMUNITY-DWELLING SENIORS (ARTICLE 3)

CHAPITRE 7 - IMPACT OF A MULTIFACETED COMMUNITY-BASED FALLS PREVENTION PROGRAM ON BALANCED RELATED PSYCHOLOGICAL FACTORS (ARTICLE 4)

LISTE DES FIGURES

LISTE DES ANNEXES

LISTE DES SIGLES, ABRÉVIATIONS ET ACRONYMES

ABC Scale: Activities-specific Balance Confidence Scale

ABC-S Scale : Activities-specific Balance Confidence-Simplified Scale

CLSC : Centre local de services communautaires

DSP : Direction de santé publique

Échelle ABC-S : Échelle ABC-Simplifiée

FCAR : Fonds pour la formation de chercheurs et l'aide à la recherche

FES : Falls Efficacy Scale

FRSQ : Fonds de recherche en santé du Québec

GRIS : Groupe de recherche interdisciplinaire en santé

HLM : Hierarchical Linear Modeling

ICIS : Institut canadien d'information sur la santé

INSPQ : Institut national de santé publique du Québec

IRSC : Instituts de recherche en santé du Canada

IRT : Item Response Theory

ISQ : Institut de la statistique du Québec

MSSS : Ministère de la Santé et des Services sociaux

OEQ : Ordre des ergothérapeutes du Québec

PIED : Programme intégré d'équilibre dynamique

PSES : Physical Self-Efficacy Scale

RQRV : Réseau québécois de recherche sur le vieillissement

SPSS : Statistical Package for Social Sciences

À ma mère Louise, ma confidente,
qui nous a quittés quelques mois
avant la fin de ce projet.
Sans aucun doute,
elle aurait été heureuse d'être témoin
de sa concrétisation…

À Jean-Guy
qui fut comme un père pour moi...

REMERCIEMENTS

En tout premier lieu, je tiens à exprimer ma profonde reconnaissance à mes deux directrices de thèse, Lucie Richard et Lise Gauvin, qui ont été de véritables mentors tout au long de cette grande aventure que constituent les études doctorales. Outre la qualité de leur supervision académique, je leur suis aussi reconnaissante pour leurs qualités humaines et pour le climat de travail agréable et stimulant qu'elles ont instauré dès le début de mon doctorat. J'espère sincèrement que d'autres projets de recherche en promotion de la santé nous donneront l'occasion de collaborer à nouveau ensemble dans le futur.

Je tiens également à remercier Yvonne Robitaille, épidémiologiste à l'Institut national de santé publique du Québec (INSPQ) qui m'a chaleureusement accueillie dans son équipe de recherche en 2003. Notre étroite collaboration au cours des dernières années fut extrêmement enrichissante tant sur les plans professionnel que personnel. Pour tout chercheur en devenir, Yvonne m'apparaît sans contredit un modèle à suivre. Son sens critique et son ouverture d'esprit, sa rigueur et son leadership pour diriger une équipe composée de chercheurs et de professionnels provenant de disciplines variées, furent extrêmement appréciés. Je la remercie aussi pour ses commentaires constructifs sur chacun des articles rédigés dans le cadre des mes études doctorales. Je souhaite également adresser mes remerciements aux autres membres de l'équipe d'évaluation du programme PIED pour leur appui et leur collaboration à mes travaux, en particulier à Sophie Laforest, Manon Parisien, Michel Fournier, Hélène Corriveau, Carole Genest et Francine Trickey.

Je tiens aussi à exprimer ma gratitude à l'égard de mes collègues de l'École de réadaptation pour leurs encouragements tout au long de mes études doctorales. Je remercie plus particulièrement ma grande amie Élisabeth Dutil, qui m'a donné le goût de la recherche il y a 24 ans déjà... Merci aussi à Bertrand Arsenault et à Daniel Bourbonnais qui ont été tour à tour directeurs de l'École de réadaptation pendant mes études doctorales. Ils ont tous les deux joué un rôle dans mon initiation à la recherche lorsque j'étais clinicienne et m'ont encouragée à poursuivre dans cette voie alors que j'enseignais au sein de leur unité académique.

Sur un plan plus opérationnel, je remercie la Direction de l'École de réadaptation de m'avoir permis de travailler dans ses locaux pendant toutes ces années. Cela a grandement facilité la réalisation de mes travaux de recherche tout en me permettant de garder contact avec mes collègues de la réadaptation et de maintenir un certain engagement dans une activité qui constitue une véritable passion pour moi : la formation des futurs professionnels de la santé. Je remercie aussi Denise D'Anjou de l'École de réadaptation, de même que Francine Goulet, pour leur soutien à l'édition finale de cette thèse. Je suis également reconnaissante pour le soutien financier de certaines institutions, en particulier le Fonds de la recherche en santé du Québec (FRSQ) et l'Ordre des ergothérapeutes du Québec (OEQ) pour l'octroi de bourses d'études, de même que la Faculté des études supérieures pour la remise d'une bourse de rédaction en fin de parcours. Je remercie également l'équipe FCAR en promotion de la santé dans les communautés et le Réseau québécois de recherche sur le vieillissement (RQRV) pour leur appui à la diffusion de mes résultats de recherche.

Enfin, je me dois de remercier tout particulièrement Benoit, mon compagnon de vie depuis 24 ans, pour sa patience et son soutien pendant toutes ces années.... pour son réconfort lors de la perte de deux êtres chers pendant la réalisation de mon projet de thèse... pour son écoute dans les moments d'hésitation... Sans son amour et la petite dose d'humour prodiguée sur une base régulière, cette thèse n'aurait jamais vu le jour. Merci aussi aux deux trésors de ma vie, mes enfants Alexandre et Emmanuelle, pour leur affection et pour m'avoir aidée à conserver, tout au long de mes études doctorales, un équilibre occupationnel si essentiel à la santé...

CHAPITRE 1 - INTRODUCTION

1.1 Problématique de recherche

Les chutes chez les aînés constituent un problème prioritaire pour la santé publique de par leur incidence et leurs conséquences en termes de santé et de qualité de vie des aînés, de même que l'ampleur des coûts qu'elles engendrent en termes de soins de santé (Marks et Allegrante, 2004; Ministère de la Santé et des Services sociaux [MSSS], 2003a). Dans les pays industrialisés, on estime que, chaque année, environ un tiers des personnes âgées de 65 ans et plus chute (Masud et Morris, 2001; O'Loughlin, Robitaille, Boivin et Suissa, 1993; Stalenhoef, Crebolder, Knottnerus et van der Horst, 1997). Les chutes constituent la principale cause de décès par traumatismes non intentionnels chez les aînés au Québec comme au Canada (Comité fédéral/provincial/territorial des hauts fonctionnaires – Aînés, 1999; Institut de la statistique du Québec [ISQ], 2000). Elles sont aussi la principale cause de blessures chez les aînés (ISQ, 2000). Le fardeau économique des chutes est également important. En effet, on estimait à 911 millions de dollars les coûts hospitaliers totaux reliés aux chutes en 2000-2001 au Canada (Institut canadien d'information sur la santé [ICIS], 2002).

Le vieillissement de la population constitue sans aucun doute un facteur qui fait de la prévention des chutes un enjeu encore plus important que doit prendre en considération la santé publique. Conséquemment, de nombreuses initiatives visant à agir en amont du problème par une approche de prévention ont vu le jour au Canada et aux États-Unis (Centers for Disease Control and Prevention, 2000; Scott, Dukeshire, Gallagher et Scanlan, 2001a).

Au Québec, la Direction générale de la santé publique du MSSS a publié en 2004 un cadre de référence pour la prévention des chutes chez les aînés vivant à domicile, destiné aux intervenants œuvrant dans ce domaine. Schématisé sous forme d'un continuum de services (figure 1), ce cadre reconnaît l'importance d'agir au-delà du domaine curatif, par des interventions de prévention et de promotion de la santé auprès d'aînés présentant différents niveaux de risque (Direction générale de la santé publique, 2004).

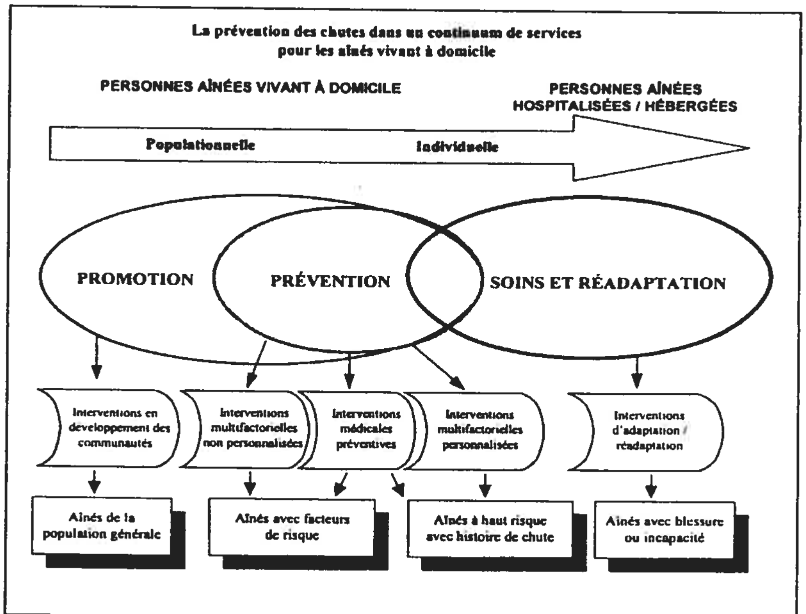


Figure 1. La prévention des chutes dans un continuum de services pour les aînés vivant à domicile
(Source : Direction générale de la santé publique, Ministère de la Santé et des Services sociaux, 2004)

Reconnaissant le rôle important de la dégradation de l'équilibre et de la force associée au vieillissement dans l'incidence des chutes chez les aînés, bon nombre d'initiatives en prévention des chutes intègrent des exercices visant à améliorer ces composantes. Des développements plus récents en matière de prévention des chutes suggèrent que les interventions devraient non seulement viser des facteurs physiques tels l'équilibre et la force comme cibles d'intervention, mais également des facteurs psychologiques tels la peur de chuter. Ces recommandations s'appuient sur un nombre croissant de données probantes à l'effet que la peur de chuter et d'autres facteurs psychologiques connexes tels une pauvre confiance en son équilibre ou en sa capacité d'éviter les chutes peuvent nuire à la santé et à la qualité de vie des aînés et peuvent même avoir un impact sur l'incidence des chutes. Par conséquent, on compte désormais la peur de chuter parmi la liste des facteurs de risque de chute connus chez cette population (Agence de santé publique du Canada, 2005; Réseau francophone de prévention des traumatismes et de promotion de la sécurité, 2005; Victorian Government Department of Human Services, 2001). En lien avec cette évolution, quelques chercheurs ont commencé à examiner l'impact de programmes d'intervention destinés à la population âgée sur la peur de chuter, sur la confiance en son équilibre ou sur le sentiment d'efficacité relative aux chutes (traduction française de l'expression *falls efficacy*). Toutefois, la recherche sur le sujet n'en est encore qu'à ses débuts. En particulier, il existe peu de données quant à l'impact des interventions communautaires de groupe comportant une composante d'exercices d'équilibre sur les facteurs psychologiques associés aux chutes.

À la lumière des considérations précédentes, le but de cette thèse est d'évaluer l'impact d'une intervention communautaire de prévention des chutes comprenant des composantes d'exercices et d'éducation offertes en groupe sur les facteurs psychologiques associés aux chutes chez les aînés vivant à domicile. Plus précisément, la thèse vise deux objectifs: 1) étudier les propriétés psychométriques d'une version simplifiée d'un instrument de mesure conçu pour évaluer la confiance des aînés en leur équilibre (l'échelle ABC-S, ou son appellation anglaise, *Activities-specific Balance Confidence (ABC)-Simplified Scale*); et 2) évaluer les effets du programme PIED sur deux facteurs psychologiques associés aux chutes, soit la confiance en son équilibre et l'équilibre perçu. Les résultats des études relatives à ces objectifs sont présentés sous forme d'articles (voir chapitres 6 et 7). Par ailleurs, la thèse inclut également deux autres articles pertinents à la démarche de recherche entreprise. Le premier consiste en une revue systématique des études relatives à l'impact d'un éventail d'interventions préventives sur les facteurs psychologiques associés aux chutes chez des aînés vivant à domicile (voir chapitre 4). Le second fournit une description détaillée de l'intervention qui a fait l'objet d'une étude évaluative dans la thèse (soit le programme PIED) et traite de questions relatives à la faisabilité de son implantation par les organismes du milieu communautaire (voir chapitre 5).

1.2 Contexte du projet de thèse

S'inscrivant dans le contexte d'un projet de recherche évaluative subventionné en 2002 par les Instituts de recherche en santé du Canada (IRSC) (ci-après désigné comme l'étude principale), les travaux relatifs à cette thèse ont débutés en 2004 et ont été réalisés à l'aide de données secondaires. L'étude principale de laquelle émanaient ces données visait à évaluer l'efficacité du programme PIED, un programme destiné à des aînés indépendants vivant à domicile mais présentant un début de risque de chute étant donné une histoire de chutes et/ou une préoccupation pour les chutes ou leur équilibre. Sous la direction de Dre Yvonne Robitaille qui était alors rattachée à la Direction de santé publique (DSP) de Montréal, cette étude avait comme principal objectif de documenter les effets du programme PIED sur l'équilibre des aînés. L'originalité de l'étude principale était d'évaluer les effets du programme tel qu'implanté par des intervenants de première ligne œuvrant dans des organismes du milieu communautaire. Ce type d'objectif découlait des recommandations de chercheurs tels que Glasgow, Lichtenstein et Marcus (2003), de même que Victora, Habicht et Bryce (2004), qui défendaient l'idée selon laquelle il ne suffit pas de démontrer qu'une intervention de santé publique est efficace dans des conditions contrôlées, mais qu'il est également essentiel de démontrer que l'intervention peut atteindre ses objectifs lorsqu'elle est implantée dans des conditions naturelles. Ces recommandations sont jugées essentielles pour l'avancement des pratiques de santé publique (Prohaska, Belansky, Belza, Buchner, Marshall, McTigue, Satariano et Wilcox, 2006). La collecte de données de l'étude principale s'est déroulée de mars 2002 à octobre 2003.

La présente thèse adopte une visée distincte de celle du projet de recherche de Dre Robitaille. En effet, l'étude des facteurs psychologiques associés aux chutes en tant que variables dépendantes ne figurait pas parmi les objectifs de l'étude principale. De plus, l'étude des propriétés psychométriques de l'instrument utilisé dans le cadre de l'étude principale pour évaluer la confiance qu'ont les aînés en leur équilibre n'était pas incluse dans le protocole de recherche de l'équipe de Dre Robitaille. De façon générale, par le regard critique qu'elle porte à la fois sur l'état des connaissances relatives à la conceptualisation et à la mesure des facteurs psychologiques associés aux chutes et sur le potentiel des programmes communautaires de prévention des chutes à agir sur ces facteurs, cette thèse apporte une contribution unique à la recherche évaluative menée par l'équipe de

Dre Robitaille. Elle contribue non seulement aux avancées scientifiques dans le domaine de la prévention des chutes, mais apporte également un éclairage qui guidera la santé publique dans ses efforts pour améliorer les programmes d'interventions visant à réduire les risques de chutes chez les aînés et à améliorer leur qualité de vie. Ainsi, ce projet s'inscrit tout à fait dans les priorités nationales de santé publique du Québec (MSSS, 2003a).

CHAPITRE 2 - RECENSION DES ÉCRITS

2.1 Les chutes chez les aînés : un problème prioritaire de santé publique

Les conséquences sur les plans humain et social engendrées par les chutes chez les aînés en font un problème prioritaire pour la santé publique (Marks et Allegrante, 2004; MSSS, 2003a). On estime que, chaque année, approximativement une personne de 65 ans et plus sur trois chute dans les pays industrialisés (Masud et Morris, 2001; O'Loughlin et al., 1993; Stalenhoef et al., 1997) et cette proportion augmente avec l'âge (Masud et Morris, 2001). Les chutes constituent la principale cause de décès par traumatismes non intentionnels chez les aînés au Québec comme au Canada (Comité fédéral/provincial/territorial des hauts fonctionnaires - Aînés, 1999; Institut de la statistique du Québec, 2000).

On rapporte que 62% des hospitalisations suite à des blessures chez les aînés canadiens sont causées par les chutes (Agence de santé publique du Canada, 2005). Au Québec, une étude récente a dénombré 13 330 chutes par année ayant entraîné une hospitalisation chez les 65 ans et plus, représentant 6% de toutes les hospitalisations dans ce groupe d'âge (Robitaille et Gagné, 2007). Les chutes seraient également responsables de 40% des admissions dans les établissements de soins de longue durée (Bezon, Echevarria et Smith, 1999; Rawsky, 1998).

Les chutes constituent la principale cause de blessures chez les aînés (ISQ, 2000). On estime qu'environ la moitié des chutes dans ce groupe d'âge entraînent une blessure mineure et qu'entre 5% et 25% des chutes causent des blessures de modérées à graves, telles qu'une fracture, un traumatisme crânien, une luxation, une entorse et ou d'autres blessures des tissus mous (Agence de santé publique du Canada, 2005; Rubenstein, Josephson et Osterweil, 1996) L'une des blessures les plus graves est certes la fracture de hanche qui entraîne un décès dans 20% des cas dans l'année suivant la fracture (Leibson, Tosteson, Gabriel, Ransom et Melton, 2002). De plus, la fracture de hanche entraîne un déclin fonctionnel dans 50% des cas (Tideiksaar, 1996). Ces pertes d'autonomie signifient souvent une charge supplémentaire pour les familles (Lin et Lu, 2005). Du côté économique, on estimait à 911 millions de dollars les coûts hospitaliers totaux à la suite de chutes en 2000-2001 au Canada (ICIS, 2002).

Le vieillissement de la population fait de la prévention des chutes un enjeu encore plus important à prendre en compte par la santé publique. Selon de récentes projections démographiques, les aînés du Québec représenteront 27% de la population totale en 2031 (ISQ, 2004), alors que cette proportion représentait 14% de la population totale en 2006 (Institut national de santé publique du Québec [INSPQ], 2006).

2.2 Les facteurs de risque de chutes

La littérature scientifique rapporte plus de 400 facteurs de risque de chute (Masud et Morris, 2001). Ceux-ci sont très diversifiés et comprennent notamment l'âge avancé, le fait d'être une femme, d'avoir une histoire de chutes, de consommer 4 médicaments ou plus, de consommer des psychotropes, de présenter des troubles d'équilibre ou une altération de la marche, des troubles visuels, un déficit cognitif, de l'incontinence urinaire, ainsi qu'une gamme de pathologies telles que l'arthrite, le diabète et la maladie de Parkinson (Evitt et Quigley, 2004; Réseau francophone de prévention des traumatismes et de promotion de la sécurité, 2005).

Les facteurs de risque de chutes sont typiquement regroupés en trois grandes catégories: 1) les facteurs intrinsèques biologiques; 2) les facteurs comportementaux; et 3) les facteurs extrinsèques. Les taxonomies plus récentes incluent toutefois une quatrième catégorie de facteurs, soit les facteurs socioéconomiques (Scott et al., 2001a). Les facteurs intrinsèques biologiques comprennent, entre autres, les changements dans les systèmes musculo-squelettique et neurologique associés au vieillissement qui entraînent une dégradation de l'équilibre, de la force et une altération de la marche, de même que certains états pathologiques aigus ou chroniques (ex. : affection neurologique, hypotension, démence). Les facteurs comportementaux regroupent une gamme de comportements tels le port de souliers inadéquats, une consommation inappropriée de médicaments et la prise de risques lors des déplacements (ex. : déplacements à la hâte, non utilisation des aides à la marche requises). Quant à eux, les facteurs environnementaux comprennent généralement les risques physiques retrouvés dans l'environnement domiciliaire (ex. : absence de main-courante dans les escaliers ou de barres d'appui dans la baignoire, aires de circulation encombrées ou mal éclairées, carpettes instables, etc.) ou dans l'environnement communautaire (ex. : trottoirs mal entretenus, escaliers non-conformes aux normes de sécurité). Enfin, les facteurs socioéconomiques incluent des éléments tels un faible revenu, un niveau de scolarité peu élevé, le chômage, un logement inadéquat, la pauvreté du réseau social et la difficulté d'accès aux services sociaux ou de santé.

Une recension de plusieurs études place les troubles d'équilibre et de marche, ainsi que la faiblesse aux premiers rangs des facteurs modifiables de risque de chutes (Rubenstein, 2006). Toutefois, plusieurs études révèlent que les chutes sont des événements complexes impliquant plusieurs facteurs en interaction (Lilley, Arie et Chilvers, 1995; Myers, Young et Langlois, 1996; Rubenstein et Josephson, 2002). À titre d'exemple, il peut s'agir d'un aîné, présentant à la fois des troubles d'équilibre et des problèmes visuels tels des cataractes, qui fait une chute à l'extérieur de son domicile à cause de l'inégalité d'un trottoir.

2.3 La peur de chuter : Un facteur de risque de chute ?

On remarque que la littérature plus récente relative à la prévention des chutes range la peur de chuter au nombre des facteurs de risque de chute (Gagnon et Flint, 2003; Réseau francophone de prévention des traumatismes et de promotion de la sécurité, 2005; Scott, Dukeshire, Gallagher et Scanlan, 2001b). La peur de chuter est un phénomène qui retient l'attention des chercheurs depuis plus de deux décennies, à cause de sa prévalence et des conséquences qu'elle peut avoir sur la santé et la qualité de vie des aînés. Les premiers écrits traitant de la peur de chuter décrivent ce phénomène comme une peur intense que ressentent certains aînés suite à une chute et qui engendre une restriction excessive d'activités, discordante avec les capacités résiduelles de la personne (Bhala, O'Donnel et Thoppil, 1982; Murphy et Isaacs, 1982).

La peur de chuter est l'une des principales craintes déclarées par les aînés. Une étude la classe même au premier rang des peurs communément rencontrées chez cette population (Howland, Peterson, Levin, Fried, Pordon et Bak, 1993). Les études ayant examiné la prévalence du phénomène auprès des aînés vivant dans la communauté indiquent des proportions variant entre 20% et 85%. Cet écart important observé entre les proportions peut s'expliquer par la variété des méthodes utilisées pour évaluer la peur de chuter, de même que par l'hétérogénéité des échantillons d'une étude à l'autre. Néanmoins, une étude récente menée auprès d'un échantillon représentatif de la population d'aînés vivant à domicile (n = 4031) indique une proportion de 54% d'aînés qui admettent avoir peur de chuter (Zijlstra, van Haastregt, van Eijk, van Rossum, Stalenhoef et Kempen, 2007a). Bien que cette peur soit l'une des conséquences possibles d'une chute, quelques études révèlent qu'elle est également présente chez de nombreux aînés qui n'ont pas chuté, dans des proportions variant entre 33% et 46% (Gagnon et Flint, 2003; Legters, 2002).

Les écrits qui traitent des conséquences néfastes de la peur de chuter sont nombreux. Bien que cette peur puisse s'avérer une réaction tout à fait raisonnable dans certains cas, notamment lorsqu'elle incite un aîné à ne pas sortir à l'extérieur par temps de verglas, la peur de chuter peut aussi être néfaste lorsqu'elle incite la personne à restreindre des activités pour lesquelles elle a les capacités requises. Dans certains cas, la peur de chuter peut être si intense qu'elle incite la personne à demeurer confinée dans son domicile (Gagnon et Flint, 2003). Quelques chercheurs se sont intéressés aux effets de la peur sur la restriction d'activités. Une étude transversale récente menée auprès de 4031 personnes âgées de 70 ans et plus vivant dans la communauté indique qu'environ 38% d'entre eux évitaient certaines activités à cause de la peur de chuter (Zijlstra et al., 2007a). Une restriction excessive des activités peut contribuer à la dégradation des capacités physiques de la personne et conduire à une perte d'autonomie (Cumming, Salkeld, Thomas et Szonyi, 2000; Delbaere, Crombez, Vanderstraeten, Willems et Cambier, 2004; Mendes de Leon, Seeman, Baker, Richardson et Tinetti, 1996). Une telle détérioration physique et fonctionnelle peut même contribuer à augmenter les risques de chute de la personne. En fait, quelques études longitudinales ont démontré que la peur de chuter et le sentiment d'efficacité relative aux chutes (un autre construit psychologique associé aux chutes) sont des prédicteurs indépendants de chutes chez les aînés vivant à domicile (Cumming et al., 2000; Friedman, Munoz, West, Rubin et Fried, 2002). Un véritable cercle vicieux peut finalement s'installer si la personne fait une chute et que celle-ci vient amplifier du même coup la peur pré-existante (figure 2).

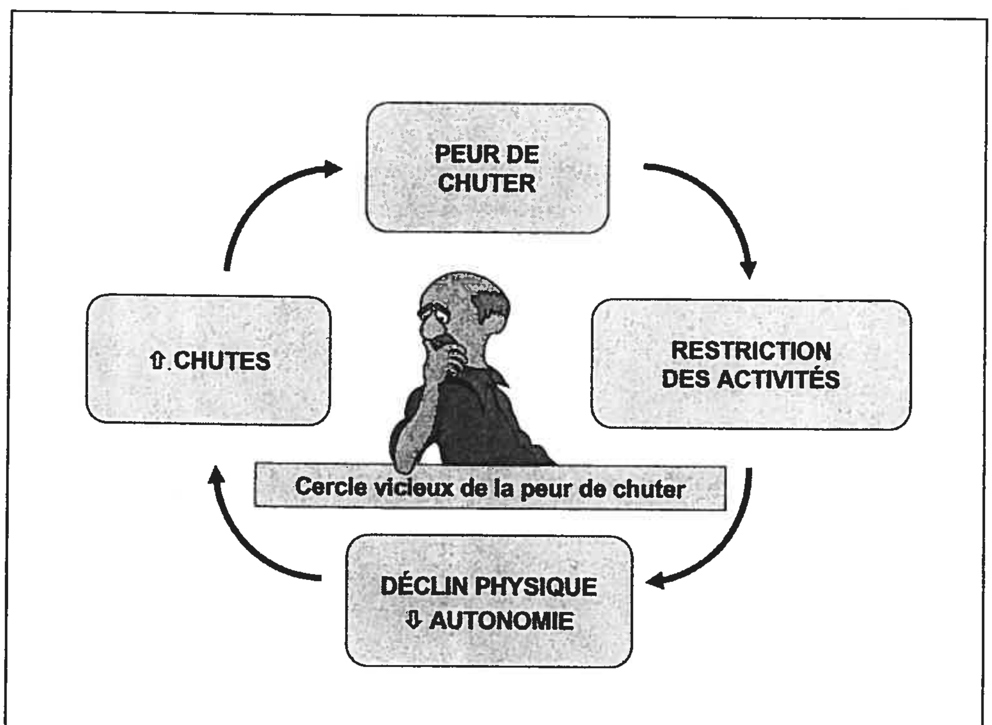


Figure 2. Cercle vicieux de la peur de chuter

Sur le plan social, d'autres conséquences de la restriction d'activités associée à la peur de chuter sont l'isolement et la dépression (Arfken, Lach, Birge, 1994; Gagnon, Flint, Naglie et Devins, 2005; Howland et al., 1993; Howland, Lachman et Peterson, 1998). En fin de compte, la participation sociale de la personne et sa qualité de vie peuvent être affectées par la peur de chuter (Bruce, Devine et Prince, 2002; Lachman, Howland, Tennstedt, Jette, Assmann et Peterson, 1998).

Du côté des déterminants, les études indiquent que, tout comme les chutes, la peur de chuter est d'origine multifactorielle (Gagnon et Flint, 2003; Legters, 2002). De plus, la peur de chuter et les chutes ont en commun plusieurs facteurs de risque. Récemment, Ziljstra et ses collaborateurs (2007a) ont trouvé des associations significatives entre la peur de chuter et l'âge, le fait d'être une femme, une perception négative de sa santé et les chutes multiples. La peur de chuter ne serait pas une simple question de vulnérabilité physique. En effet, elle aurait également des déterminants psychosociaux. Des associations significatives ont été trouvées entre la peur de chuter et de faibles contacts sociaux (Howland et al., 1998), une faible satisfaction dans la vie (Arfken et al., 1994), une humeur dépressive (Arfken et al., 1994; Gagnon et al., 2005) et des troubles d'anxiété (Gagnon et al., 2005). Howland et ses collaborateurs (1998) ont aussi trouvé une relation entre la restriction d'activités reliée à la peur de chuter et le fait de ne pas parler ouvertement des chutes, de ne pas avoir de soutien social ou le fait de connaître une personne qui a fait une chute récente. Toutefois, les conclusions de ces études sont souvent limitées par la nature transversale des devis utilisés. Une étude longitudinale a cependant démontré que l'histoire de chutes était effectivement un prédicteur de la peur de chuter et vice-versa (Friedman et al., 2002). L'étude longitudinale de Murphy, Dubin et Gill (2003) a aussi permis d'identifier que l'âge, un déficit de l'acuité visuelle, un style de vie sédentaire et l'absence de soutien affectif étaient associés au développement de la peur de chuter.

Compte tenu des effets néfastes de la peur de chuter sur plusieurs plans, un certain nombre de chercheurs ont suggéré que les programmes de prévention des chutes devraient également cibler la peur de chuter et les autres facteurs psychologiques associés aux chutes et que ces facteurs devraient être pris en compte par la santé publique (Lachman et al., 1998; Simpson, Marsh et Harrington, 1998; Simpson et Jones, 2004; Tinetti, Mendes de Leon, Doucette et Baker, 1994a). Afin d'évaluer l'impact des programmes de prévention des chutes sur ces facteurs, les chercheurs peuvent avoir recours à une gamme d'instruments de mesure qui ont été développés pour évaluer la peur de chuter ou des construits psychologiques connexes, tels la confiance en son équilibre et le sentiment d'efficacité relative aux chutes.

2.4 Mesure des facteurs psychologiques associés aux chutes

La recension des écrits montre que la peur de chuter est typiquement évaluée au moyen d'une simple question : « Avez-vous peur de chuter ? » (Jørstad, Hauer, Becker et Lamb, 2005). Bien que cette mesure soit simple à utiliser, elle fait l'objet de plusieurs critiques. On lui reproche d'abord un manque de sensibilité, plus particulièrement lorsque l'échelle de réponses est dichotomique (oui/non). Pour plus de précision, certains auteurs ont opté pour des échelles ordinales. Toutefois, le nombre d'options de réponses (3, 4 ou 5 catégories) et le regroupement des catégories pour définir opérationnellement ce qui constitue une peur de chuter importante varient grandement d'une étude à l'autre. Ceci pourrait certes contribuer à expliquer la variabilité observée dans les études en ce qui a trait à la prévalence du phénomène. De plus, la mesure de la peur de chuter à l'aide d'une simple et unique question est sujette à un certain nombre de biais (Tinetti, Richman et Powell, 1990). La peur de chuter peut notamment véhiculer une connotation psychiatrique, lorsqu'elle est assimilée à une phobie. Il est ainsi possible que des aînés s'abstiennent de révéler leur peur afin d'éviter la stigmatisation. De plus, quelques chercheurs soulèvent la possibilité d'un biais lié au sexe des répondants, à savoir que les hommes seraient moins portés que les femmes à admettre qu'ils ont peur de chuter (Myers, Powell, Maki, Holliday, Brawley et Sherk, 1996). Les aînés peuvent également omettre de révéler leur peur par crainte d'une éventuelle institutionnalisation. À l'opposé, d'autres aînés peuvent rapporter une peur exagérée afin de gagner la sympathie ou l'attention de leur entourage.

Un autre problème relié à la mesure de la peur de chuter réside dans le fait que deux personnes qui ont un profil fonctionnel semblable et qui limitent leurs activités à cause de leur peur de chuter pourraient répondre bien différemment à la question : 1) l'une pourrait répondre qu'elle n'a pas peur de chuter puisqu'elle ne vit plus de situations anxiogènes; 2) l'autre pourrait répondre qu'elle a, de fait, peur de chuter puisque cette peur l'incite même à limiter certaines de ses activités. Enfin, la peur de chuter est un concept large pouvant englober différentes dimensions (Yardley et Smith, 2002). L'évaluation de la peur de chuter à l'aide d'une simple question ne permet pas de faire la part entre le risque perçu par la personne face aux chutes et la peur des conséquences des chutes qui peuvent être de nature multiple. Pour certains aînés, la peur de chuter peut référer à la peur de la douleur consécutive à une blessure anticipée. Pour d'autres personnes, elle renvoie à la peur de ne plus pouvoir se relever à la suite d'une chute et/ou à l'embarras social de faire une chute devant d'autres personnes. La peur de chuter peut également être associée à la peur de perdre son autonomie, d'être hospitalisé ou institutionnalisé. Bref, bien qu'une simple question sur la peur de chuter puisse être utile comme outil de dépistage, ses nombreuses limites ont poussé certains chercheurs à développer d'autres instruments pour évaluer des facteurs psychologiques connexes associés aux chutes, dont la confiance en son équilibre et le sentiment d'efficacité relative aux chutes.

Le sentiment d'efficacité relative aux chutes a été introduit en 1990 par Tinetti et ses collaborateurs. Ce construit correspond à la confiance de la personne en sa capacité d'éviter une chute. Pour évaluer ce construit, Tinetti et ses collègues ont élaboré un questionnaire appelé le *« Falls Efficacy Scale »* ou FES composé de 10 items correspondant à des activités de la vie quotidienne (Tinetti et al., 1990). On demande à la personne d'indiquer sur une échelle de 1 à 10 son degré de confiance en sa capacité de réaliser chacune des activités sans chuter. Le FES s'appuie sur la théorie d'efficacité personnelle qui stipule que le sentiment d'efficacité personnelle est un prédicteur du comportement (Bandura, 1977; Bandura, 1986). Ainsi, une personne ayant une confiance élevée en sa capacité d'éviter une chute lors de certaines activités quotidiennes, sera davantage susceptible de s'engager dans ces activités. Les items de l'outil comprennent des activités usuelles telles "se laver ou prendre une douche" et "s'habiller et se déshabiller". Le FES possède une bonne consistance interne et est corrélé avec des mesures d'équilibre et de marche (Tinetti et al., 1990). Il est également un bon prédicteur d'un déclin de la capacité fonctionnelle et des chutes (Cumming et al., 2000; Mendes de Leon et al., 1996; Tinetti et al., 1990). Toutefois, il est sujet à un effet plafond lorsqu'il est utilisé avec des aînés autonomes vivant à domicile. Pour pallier cette lacune, Powell et Myers ont créé un autre instrument appelé « *Activities-specific Balance Confidence (ABC) Scale* » (Powell et Myers, 1995). Ce questionnaire inclut un éventail d'items plus large que le FES représentant des niveaux de difficulté variés. Toutefois, plutôt que d'évaluer le sentiment d'efficacité personnelle relatif aux chutes, l'échelle ABC évalue la confiance de la personne en son équilibre reliée à des tâches motrices du quotidien. La question de départ de l'outil original est: *"How confident are you that you will not lose your balance or become unsteady when you [list of items]?"*. L'outil comprend 16 items correspondant à des tâches motrices réalisées à la fois dans l'environnement domiciliaire (ex. : marcher dans la maison, se tenir sur la pointe des pieds pour aller chercher un objet placé au-dessus de sa tête) et dans l'environnement communautaire (ex. : traverser un terrain de stationnement pour se rendre au centre commercial). L'échelle originale requiert que la personne indique son degré de confiance en son équilibre sur une échelle continue variant de 0% à 100%. Tout comme le FES, l'échelle ABC a démontré de bonnes qualités psychométriques lorsqu'utilisée avec des aînés vivant dans la communauté (Myers et al., 1996; Powell et Myers, 1995).

Depuis leur développement initial, des versions modifiées du FES et de l'échelle ABC et d'autres instruments ont vu le jour (Filiatrault, Gauvin, Fournier, Parisien, Laforest, Robitaille, Corriveau et Richard, 2007a; Hill, Schwarz, Kalogeropoulos et Gibson, 1996; Jørstad et al., 2005; Lachman et al., 1998; Lusardi et Smith, 1997; Yardley, Beyer, Hauer, Kempen, Piot-Ziegler et Todd, 2005). Les chercheurs ont maintenant accès à de nombreux instruments pour évaluer l'impact des interventions sur divers facteurs psychologiques associés aux chutes.

2.4.1 La mesure de la confiance en son équilibre : de nouveaux développements

À la suite d'une expérimentation de l'échelle ABC auprès d'un groupe d'aînés autonomes vivant à domicile, l'équipe du Dre Robitaille constata que cet outil présentait certaines lacunes. La formulation de la question initiale et l'échelle de réponses semblaient plus ou moins conviviales pour les répondants. L'équipe entreprit donc de modifier l'outil original. Par la suite, au cours de discussions entourant l'analyse, un item de l'échelle apparut à l'équipe comme étant plus ou moins consistant avec les messages véhiculés par la santé publique en matière de prévention des chutes (item « marcher sur des trottoirs glacés ») et, par conséquent, fut retiré de l'échelle. La version modifiée de l'échelle ABC (désignée échelle ABC-S) comporte une question de départ plus facile à interpréter et une échelle de réponses plus simple à utiliser pour les répondants. De plus, elle inclut 15 items plutôt que 16. La nouvelle échelle a fait l'objet d'une étude psychométrique dans le cadre de cette thèse. Les détails concernant les modifications apportées à l'outil, de même que les résultats de l'étude psychométrique sont présentés au chapitre 6 sous la forme d'un article paru dans le numéro de mai 2007 de la revue *Archives of Physical Medicine and Rehabilitation*.

2.5 Distinction entre les construits psychologiques associés aux chutes

Même si la peur de chuter, la confiance en son équilibre et le sentiment d'efficacité relative aux chutes sont des construits associés, ils ne sont pas pour autant isomorphes (Jørstad et al., 2005; Li, McAuley, Fisher, Harmer, Chaumaton et Wilson, 2002). En effet, il est possible pour une personne qui se dit confiante en sa capacité d'éviter les chutes, de présenter malgré tout une peur de chuter car elle craint certaines des conséquences que pourraient entraîner une chute (ex. : perdre son autonomie et être institutionnalisée). La recension des écrits révèle toutefois que les différents construits sont souvent utilisés de façon interchangeable (Filiatrault, Gauvin, Laforest, Robitaille, Richard et Corriveau, soumis; Jørstadt et al., 2005). Quelques éléments permettent toutefois de mieux distinguer ces trois construits.

Comme on l'a vu précédemment, la peur de chuter est un concept plutôt large, pouvant regrouper différentes formes de peurs plus spécifiques (ex.: peur de la douleur, peur de ne pas pouvoir se relever suite à une chute, peur de l'embarras social, peur de perdre son autonomie, d'être hospitalisé ou institutionnalisé). Quant aux concepts d'efficacité relative aux chutes et de confiance en son équilibre tels que mesurés par le FES et l'échelle ABC, ils réfèrent à des situations spécifiques (i.e., les aînés doivent se référer à des activités ou à des tâches précises de la vie quotidienne pour donner leurs réponses). Ceci pourrait expliquer que le concept d'efficacité relative aux chutes soit davantage associé au fonctionnement quotidien que la peur de chuter (Tinetti et al., 1994a). De plus, la peur de chuter réfère à l'éventualité d'un événement futur. En ce sens, elle diffère de la confiance en sa capacité de maintenir son équilibre ou du sentiment d'efficacité relative aux chutes qui réfèrent à des perceptions reliées aux capacités actuelles de la personne.

Bien qu'il y ait davantage de points communs entre les concepts évalués par l'échelle ABC et le FES, puisqu'ils sont tous les deux reliés à des tâches ou à des activités de la vie quotidienne, ils se distinguent tout de même à certains égards. Premièrement, l'échelle ABC traite de confiance en son équilibre alors que le FES traite de la capacité à éviter les chutes. Lorsqu'une personne donne son appréciation de sa confiance en son équilibre lors de différentes tâches de la vie quotidienne (échelle ABC), il est probable qu'elle réfère en bonne partie à une appréciation de son équilibre. Pour ce qui est de la confiance en sa capacité d'éviter les chutes lors d'activités de la vie quotidienne (FES), il est probable que la personne fasse non seulement appel à une évaluation de son équilibre pour donner ses réponses, mais également à une appréciation de sa capacité à utiliser un large répertoire de stratégies pour éviter de chuter (ex. : ralentir la cadence, être plus vigilant en présence d'obstacles sur son chemin, utiliser une canne,...). Une deuxième nuance entre l'échelle ABC et le FES tient au fait que les items du FES correspondent à des activités de la vie quotidienne, alors que les items de l'échelle ABC correspondent à des tâches motrices plus précises. Une activité de la vie quotidienne est un concept beaucoup plus large qu'une simple tâche motrice. En effet, une activité telle que prendre son bain implique une série de tâches (ex. : se déplacer jusqu'à la baignoire, enjamber le rebord du bain, s'asseoir au fond de la baignoire, se laver, etc.). Par conséquent, «éviter de faire une chute » lors d'une activité de la vie quotidienne fait appel à un plus large répertoire de stratégies comportementales que « maintenir son équilibre » lors d'une tâche motrice comme « marcher dans la maison ».

A la lumière de ces considérations, les construits peur de chuter, confiance en son équilibre et sentiment d'efficacité aux chutes apparaissent comme des construits distincts bien qu'ils soient reliés entre eux. Des études quant aux déterminants respectifs de ces construits seraient utiles pour confirmer cette hypothèse.

2.6 Les programmes de prévention destinés aux aînés vivant à domicile

Une gamme d'interventions ont été mises au point afin de prévenir les chutes chez les aînés vivant à domicile. Celles-ci comprennent notamment des interventions éducatives, des interventions visant à modifier l'environnement domiciliaire, des interventions visant à diminuer la consommation de psychotropes, des exercices et des interventions multifactorielles combinant plusieurs stratégies (Scott et al., 2001b). La littérature sur l'efficacité des interventions révèle que les interventions multifactorielles personnalisées et les exercices figurent parmi les meilleures stratégies pour réduire les chutes chez les aînés (Gillepsie, Gillespie, Robertson, Lamb, Cumming et Rowe, 2003). En ce qui concerne les exercices, les interventions comportant une composante d'équilibre seraient particulièrement efficaces et ce, autant lorsqu'elles sont offertes sur une base individuelle, qu'en groupe (Barnett, Smith, Lord, Williams et Baumand, 2003; Day, Fildes, Gordon, Fitzharris, Flamer et Lord, 2002; Gardner, Robertson et Campbell, 2000; Gillespie et al., 2003; Province, Hadley, Hornbrook, Lipsitz, Miller, Mulrow, Ory, Sattin, Tinetti et Wolf, 1995). On note toutefois que ces études ont surtout permis de montrer l'efficacité des interventions utilisant l'exercice dans des conditions optimales, c'est-à-dire à l'aide de devis de recherche randomisés. Plus récemment, des chercheurs en santé publique ont soutenu l'importance d'aller au-delà des recherches évaluatives se déroulant dans des conditions contrôlées, en examinant l'efficacité des interventions lorsqu'elles sont implantées dans des conditions naturelles. L'enjeu est d'examiner dans quelle mesure les interventions dites efficaces en milieu contrôlé le sont également lorsqu'elles sont offertes plus largement en milieu clinique ou communautaire. À cet égard, les résultats d'une étude menée par l'équipe de Dre Robitaille indiquent qu'un programme communautaire de prévention des chutes comportant notamment des exercices d'équilibre réalisés en groupe était efficace pour améliorer l'équilibre des participants, lorsque ce programme était offert par les organismes du milieu communautaire (voir article de Robitaille, Laforest, Fournier, Gauvin, Parisien, Corriveau, Trickey et Damestoy (2005) à l'annexe 1). Une analyse de l'implantation du programme a aussi révélé que les organismes du milieu communautaire étaient aptes à recruter la population cible du programme, à offrir le programme selon ses lignes directrices et à assurer un bon taux de participation au programme (voir article de Filiatrault, Parisien, Laforest, Genest, Gauvin, Fournier, Trickey et Robitaille (2007b) au chapitre 5).

Par ailleurs, tel que mentionné précédemment, des développements plus récents en matière de prévention des chutes suggèrent que les interventions destinées aux aînés autonomes de la communauté devraient non seulement viser des facteurs physiques tels l'équilibre et la force, mais également des facteurs psychologiques comme la peur de chuter. Par conséquent, un autre enjeu de la recherche évaluative est d'examiner l'impact de divers programmes d'intervention conçus pour les aînés vivant à domicile sur la peur de chuter, sur la confiance en leur équilibre ou sur le sentiment d'efficacité relative aux chutes.

2.7 Les études relatives à l'impact des interventions sur les facteurs psychologiques associés aux chutes

Bien qu'un nombre croissant de chercheurs s'intéressent à l'étude des effets des interventions sur les facteurs psychologiques associés aux chutes, peu d'efforts de synthèse des résultats de ces études avaient été réalisés jusqu'à tout récemment. Une telle synthèse s'avère pourtant essentielle à l'identification des interventions efficaces dans ce domaine. Une première revue systématique des études traitant de l'impact de diverses interventions préventives sur les facteurs psychologiques associés aux chutes chez les aînés vivant à domicile a récemment été publiée (Zijlstra, van Haastregt, van Rossum, van Eijk, Yardley et Kempen, 2007b). Celle-ci montre que ces facteurs peuvent être améliorés par le biais de certaines interventions, telles les programmes de Tai Chi offert en groupe, les programmes d'exercices individualisés offerts à domicile et les interventions multifactorielles personnalisées offertes à domicile comprenant à la fois de l'éducation relativement aux facteurs de risque de chutes et des exercices. Toutefois, les auteurs de cette revue systématique ont synthétisé les résultats des études en regroupant tous les facteurs psychologiques associés aux chutes sous un seul construit général (soit celui de la peur de chuter), en dépit du fait que ces facteurs ne soient pas isomorphes (Jørstad et al., 2005; Li et al., 2002). Conséquemment, les futurs travaux de recherche devraient examiner l'impact des interventions en considérant chaque facteur psychologique séparément.

D'autre part, bien que les programmes de promotion de la santé conçus pour les aînés autonomes, telles que les interventions de prévention des chutes, constituent fréquemment des ensembles complexes et hétérogènes, les revues des études évaluatives ne rapportent bien souvent que des descriptions superficielles des interventions (Herbert et Bø, 2005). Une décomposition des interventions selon leurs caractéristiques précises (c'est-à-dire leurs stratégies, leur contenu et le processus d'implantation) peut s'avérer utile pour les intervenants de la santé publique en leur fournissant un guide pour sélectionner les interventions les plus appropriées en fonction de leur contexte particulier (Richard, Gauvin, Gosselin, Ducharme, Sapinski et Trudel, sous presse). Ainsi, les intervenants et les décideurs de la santé publique pourraient trouver utile d'être informés des stratégies (ex. : exercice, éducation, ou combinaison de stratégies), de l'approche (ex. : approche de groupe ou approche individuelle) et du contexte d'implantation (ex. : à domicile ou dans la communauté) des interventions. Également, une description des stratégies, du contenu et du processus d'implantation des interventions par rapport à leurs effets sur les facteurs psychologiques associés aux chutes pourrait contribuer à guider les recherches futures en santé publique. Enfin, le nombre d'écrits relatifs à la prévention des chutes augmente à un rythme effréné (Close, 2005). Par conséquent, la littérature doit être recensée périodiquement pour s'assurer de l'implantation de pratiques de prévention des chutes qui soient fondées sur les données probantes les plus récentes. À la lumière des considérations précédentes, une revue systématique des études relatives à l'impact des interventions préventives sur les facteurs psychologiques associés aux chutes a été menée en considérant chacun des facteurs séparément. Cette revue, présentée au chapitre 4, fait l'objet de l'un des quatre articles de la thèse. L'article comprend également une description détaillée des interventions en termes de stratégies, de contenu et de processus.

CHAPITRE 3 - MÉTHODOLOGIE

3.1 L'intervention

L'intervention à l'étude est le programme PIED (Programme intégré d'équilibre dynamique). Ce programme a été élaboré en 1995 par une équipe d'intervenants et de chercheurs de la Direction de santé publique de Montréal en collaboration avec des experts des domaines de la réadaptation et de l'activité physique, de même que des représentants des milieux communautaires. Il s'agit d'un programme multifactoriel de prévention des chutes destiné à des aînés autonomes vivant à domicile. La version originale du programme comportait trois volets, soit des exercices stimulant l'équilibre et la force, du Tai Chi et des capsules d'éducation, le tout se déroulant en groupe (Trickey, Parisien, Robitaille, Gosselin et Laforest, 1999a; Trickey, Robitaille, Laforest, Gosselin et Parisien, 1999b). Les commentaires reçus suite à l'implantation initiale du programme par des intervenants du milieu communautaire ont amené l'équipe à identifier certains obstacles à sa mise en œuvre, ce qui a donné lieu à une version remaniée du programme (Trickey, Robitaille, Damestoy, Genest, Laforest et Parisien, 2001; Trickey, Parisien, Laforest, Genest et Robitaille, 2002). Parmi les modifications apportées au programme, le volet Tai Chi qui comportait une séance d'une heure par semaine devant être animée par un instructeur ayant reçu une formation dans cette discipline, a été éliminé car il s'avérait difficile à mettre en place par les milieux communautaires.

Dans sa présente version, le programme comporte les trois volets suivants (voir figure 3), soit : 1) des exercices stimulant l'équilibre effectués en groupe (une heure, deux fois par semaine); 2) un module d'exercices à domicile (module de 30 minutes, à raison d'au moins une fois par semaine); et 3) des capsules d'éducation en groupe (d'une durée de 30 minutes, une fois par semaine).

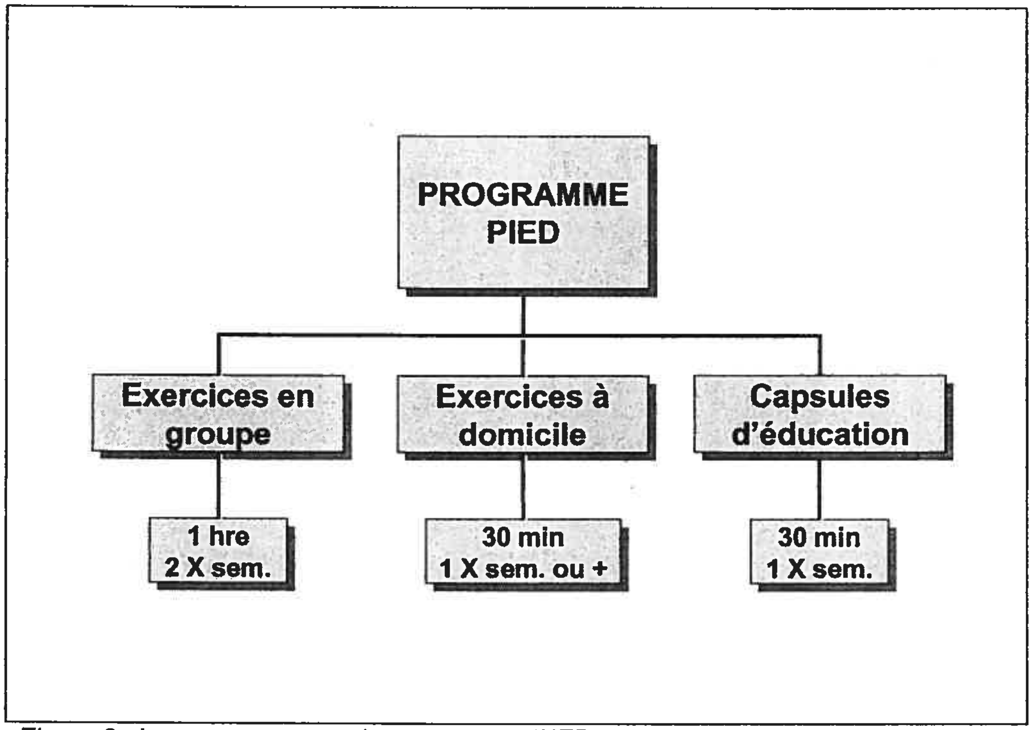


Figure 3. Les composantes du programme PIED

D'une durée de 12 semaines, le programme PIED vise principalement à améliorer l'équilibre et la force des membres inférieurs, ainsi qu'à habiliter les personnes à réduire les risques présents dans leur domicile et à adopter des comportements sécuritaires. Il vise ainsi trois catégories de facteurs de risque de chute (voir figure 4). Le programme a comme autres objectifs d'améliorer le sentiment d'efficacité relative à la prévention des chutes, de favoriser l'adoption d'une pratique régulière d'activité physique et de maintenir la densité osseuse.

L'altération de l'équilibre reliée au le vieillissement étant reconnue comme l'un des principaux facteurs de risque de chutes chez les aînés (Rubenstein, 2006), le programme cible tout particulièrement l'équilibre (d'où son nom : Programme intégré d'**équilibre** dynamique). Une étude menée en 2005 a démontré des effets bénéfiques du programme PIED sur l'équilibre des participants (voir article de Robitaille et al. (2005) à l'annexe 1).

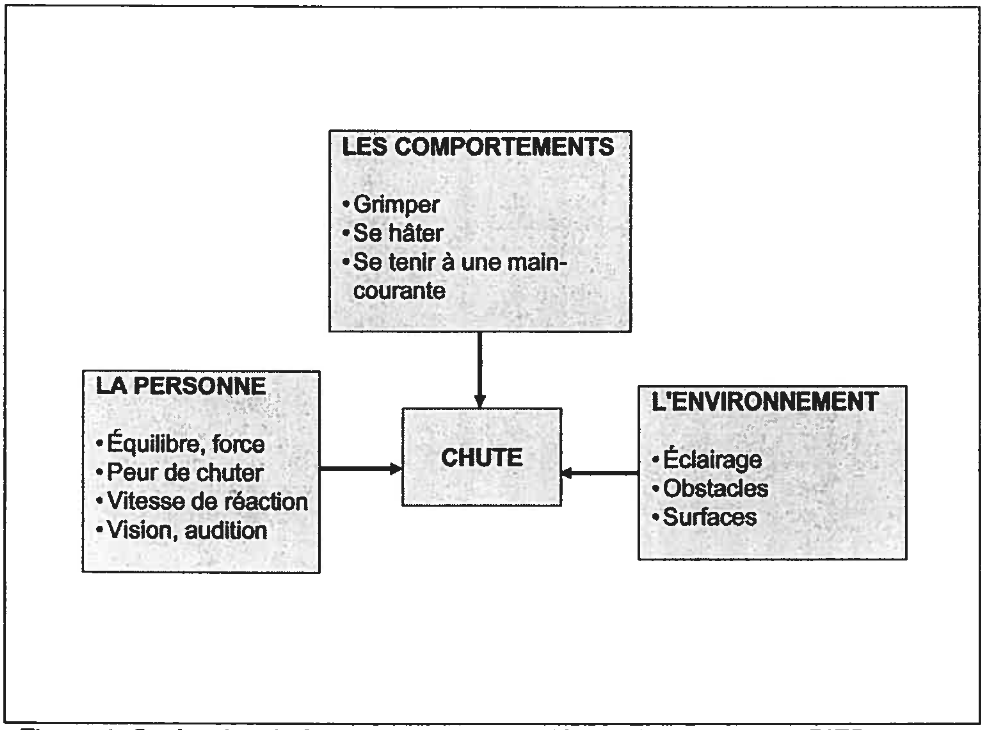


Figure 4. Catégories de facteurs de risque ciblés par le programme PIED
Source : Adapté de Trickey et al. (2002). *Programme intégré d'équilibre dynamique - PIED. Guide d'animation*. Montréal, QC: Direction de santé publique de Montréal.

La composante d'exercices en groupe que comprend le programme a pour objectif d'améliorer l'équilibre, la force des membres inférieurs et la flexibilité des chevilles, de stimuler la proprioception, de maintenir la densité osseuse aux sites qui sont à risque de fractures (poignets, hanches, colonne), ainsi que d'améliorer la capacité à se relever du sol. Chaque séance d'exercices se déroule en quatre étapes, soit : 1) les exercices d'échauffement; 2) les exercices d'équilibre; 3) les exercices de renforcement; et 4) les étirements et la relaxation. La figure 5 donne un aperçu de quelques exercices inclus dans le programme.

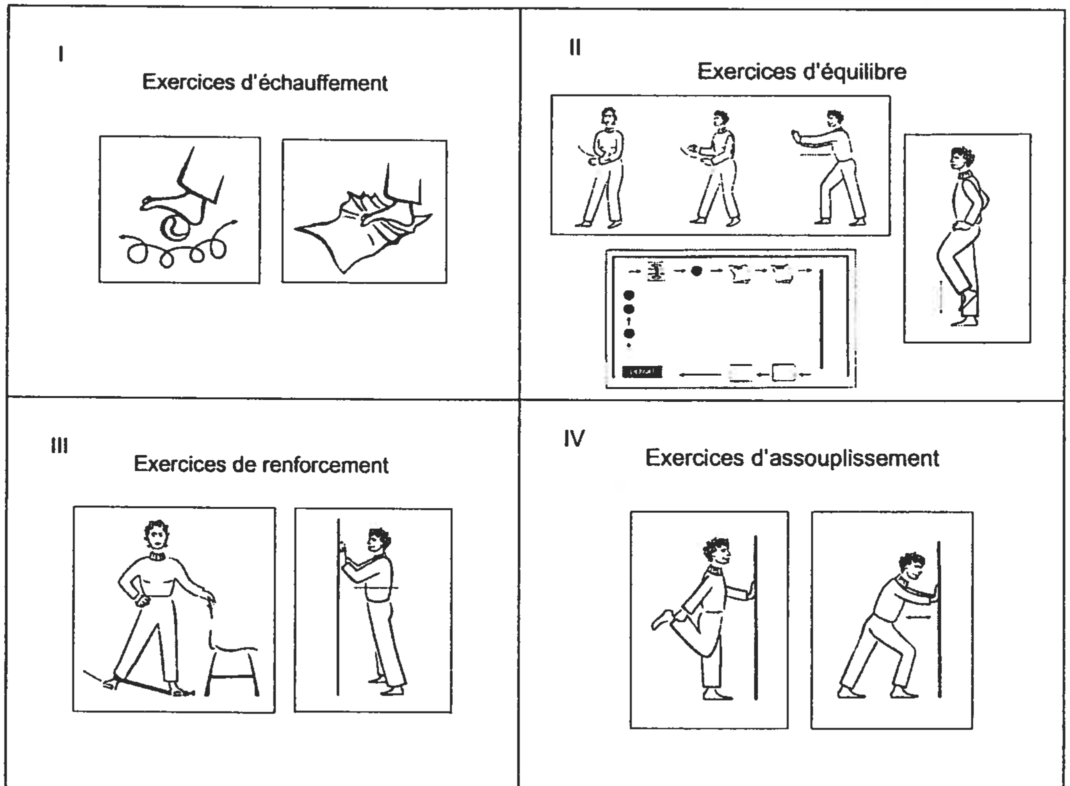


Figure 5. Exemples d'exercices inclus dans le programme PIED
(I – Exercices pour stimuler la proprioception et la flexibilité des chevilles et des pieds; II – Mouvement inspiré du Tai Chi, exercice pour améliorer l'équilibre unipodal et vue aérienne d'un trajet à parcourir incluant des objets à enjamber et une ligne tracée au sol pour la pratique de la marche en tandem; III – Exercice avec élastique et exercice de « push-up » adapté pour la position debout; IV – Exercices d'assouplissement des quadriceps et des muscles du mollet). Source : Adapté de Trickey et al. (2002). *Programme intégré d'équilibre dynamique - PIED. Guide d'animation*. Montréal, QC: Direction de santé publique de Montréal

Le module d'exercices à domicile consiste en 12 exercices simples à exécuter au moins une fois par semaine pendant la durée du programme et quelques fois par semaine lorsque le programme est terminé. Ces exercices sont expliqués et pratiqués au cours de la première séance d'exercices de groupe et sont illustrés sur une affichette que les participants peuvent utiliser à la maison comme guide et aide-mémoire.

La partie éducative du programme PIED consiste en une série de 10 séances hebdomadaires d'information et de discussion d'une durée de trente minutes. Afin de maintenir un taux de participation élevé, ces séances ont lieu au début ou à la fin d'une séance d'exercices. Les séances éducatives permettent d'aborder divers sujets tels les facteurs de risque de chute et les stratégies visant à améliorer la sécurité dans chacune des pièces du domicile et à promouvoir les comportements sécuritaires (ex. : vigilance lors de ses déplacements, port de chaussures adéquates, usage approprié de médicaments, pratique régulière d'activité physique et adoption de comportements favorables à la prévention de l'ostéoporose).

Le programme a été conçu pour être offert à des groupes de 10 à 15 aînés, par des organismes communautaires, notamment les Centres locaux de services communautaires (CLSC) et les centres communautaires pour aînés. Outre le fait qu'il ait été développé en partenariat avec des organismes du milieu communautaire, l'une des forces du programme PIED réside dans ses bases conceptuelles. En effet, les deux composantes d'exercices du programme s'appuient sur des données probantes quant aux principes d'entraînement physique (American College of Sports Medicine, 2000; Topp, Mikesky et Bawel, 1994) et aux sous-systèmes contribuant au maintien postural (Duncan, Chandler, Studenski, Hughes et Prescott, 1993). Quant à la composante éducative du programme, elle préconise une approche s'inspirant de modèles de changements comportementaux (Bandura, 1977; Bandura, 1986; Green et Kreuter, 2005; Rosenstock, 1990). Ainsi, cette composante du programme va bien au-delà de la simple transmission d'informations relatives aux facteurs de risque de chutes, en mettant l'accent sur le partage d'expériences personnelles, l'apprentissage basé sur l'observation, la réflexion personnelle, l'expérimentation et le renforcement positif.

Bien que le programme PIED ait été conçu dans le but de répondre aux besoins des personnes âgées autonomes, il cible tout particulièrement celles qui présentent un certain risque de chutes, c'est-à-dire des personnes ayant une histoire de chutes, ayant peur de chuter ou étant préoccupées par leur équilibre. Étant donné le niveau de risque de cette population, il est recommandé que le programme soit offert par des professionnels d'expérience en réadaptation ou en activité physique. Le programme PIED est déjà implanté dans plusieurs organismes communautaires au Québec et il est appelé à être implanté à plus large échelle. En effet, un comité consultatif ayant pour mandat la formulation de recommandations au Ministère de la Santé et des Services sociaux en matière de prévention des chutes, a suggéré qu'une intervention ciblant plusieurs facteurs de risque de chutes, telle que le programme PIED, soit offerte par les organismes du milieu communautaire aux personnes âgées autonomes qui présentent un certain niveau de risque de chute (Direction générale de la santé publique, 2004). Conformément à cette recommandation, l'INSPQ travaille présentement à la formation de professionnels afin de faciliter l'implantation du programme PIED à l'échelle provinciale. Pour plus de renseignements au sujet de l'intervention, le lecteur est invité à se référer à l'article présenté au chapitre 5. En plus de fournir une description détaillée du programme, cet article traite également de la faisabilité d'une telle implantation par les organismes du milieu communautaire.

3.2 Devis de recherche

Le devis utilisé pour l'étude de l'impact du programme PIED sur les facteurs psychologiques associés aux chutes est le même que celui utilisé par l'étude principale soit, un devis quasi-expérimental de type pré-post avec groupe témoin. Le choix d'un devis quasi-expérimental reposait sur la décision de l'équipe de recherche de Dre Robitaille d'évaluer l'efficacité du programme PIED lorsqu'implanté dans des conditions naturelles. Ainsi, Il n'y a pas eu randomisation des participants puisque les organismes communautaires étaient maîtres d'œuvre, ce qui impliquait le recrutement des participants. La randomisation des organismes a été considérée initialement, puis rejetée, car elle aurait impliqué l'exclusion des organismes qui offraient déjà une version antérieure du programme, donc l'exclusion des organismes qui reflétaient le mieux les conditions naturelles. À défaut de randomisation, le devis prévoyait divers autres moyens pour favoriser la similitude des groupes expérimentaux et témoins (i.e., similitude des organismes expérimentaux et témoins, calendrier de recrutement), ainsi que le contrôle de plusieurs variables confondantes dans les analyses afin de s'assurer de la validité interne de la recherche (Victora et al., 2004).

Comme l'étude principale se proposait d'évaluer l'efficacité du programme PIED lorsque celui-ci était implanté dans des conditions naturelles, le programme a été offert par les organismes du milieu communautaire. Des représentants de ces milieux étaient responsables à la fois du recrutement de la population cible et du recrutement d'un animateur qualifié pour offrir le programme. Ils devaient aussi veiller à l'achat du matériel requis et à la disponibilité d'une salle convenable à la tenue des séances de groupe.

Enfin, puisque l'étude principale visait également à examiner l'effet du programme PIED sur l'équilibre à plus long terme, le devis prévoyait colliger des données prospectives sur une période de 12 mois, soit : à l'entrée dans l'étude (T1), immédiatement après le programme (T2), puis trois mois et neuf mois après la fin du programme (T3 et T4). Dans le cadre de cette thèse, l'étude des propriétés psychométriques de l'échelle ABC-S a été réalisée aux moyens des données colligées à l'entrée des participants dans l'étude. L'étude évaluative a pour sa part été réalisée à l'aide des données colligées à l'entrée dans l'étude et à la fin de la mise en œuvre du programme, soit 3 mois plus tard. La figure 6 illustre le devis utilisé pour l'étude principale et la thèse. Elle situe également à l'intérieur de ce devis les deux études menées dans le cadre de la thèse.

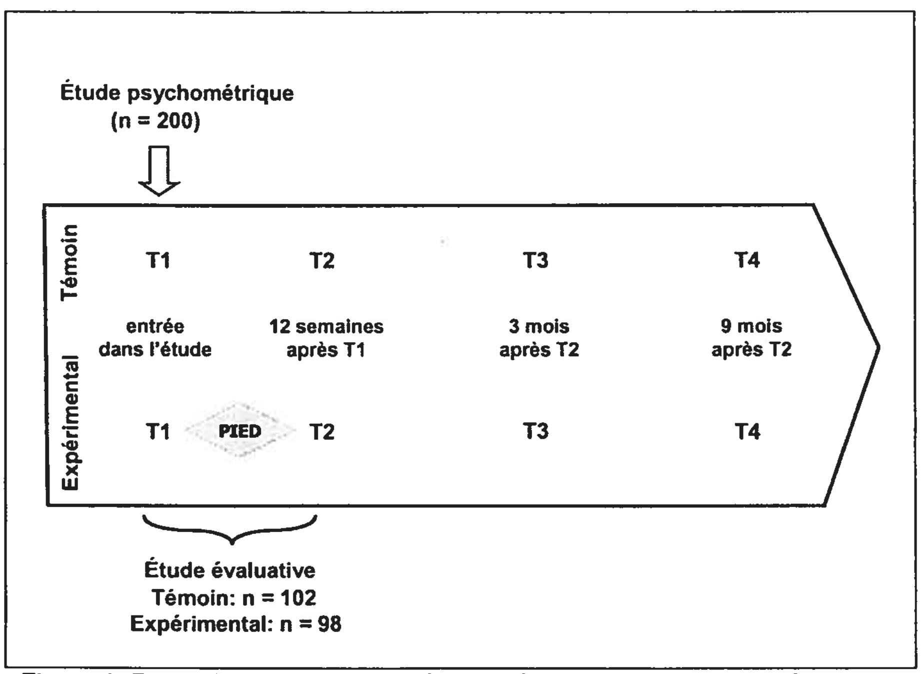


Figure 6. Devis de recherche utilisé pour l'étude principale et la thèse

3.3 Cadre conceptuel

La figure 7 illustre le modèle logique du programme. Ce modèle permet d'identifier les trois volets du programme PIED, son contexte d'implantation, les conditions nécessaires à l'atteinte des résultats (zone hachurée), les effets proximaux attendus sur les principaux facteurs visés par le programme et les effets ultimes sur la santé. Les zones ombragées représentent les ajouts proposés dans le cadre de la thèse par rapport au modèle initial conceptualisé pour le programme. Ainsi, le modèle stipule que les effets proximaux du programme sur l'équilibre et la force, sur le mode de vie actif et les comportements sécuritaires, de même que sur les actions visant à réduire les risques dans l'environnement domiciliaire sont susceptibles d'avoir un impact positif sur les facteurs psychologiques associés aux chutes. Ceci correspond à l'hypothèse de recherche associée à l'article 4 de cette thèse (voir chapitre 7). L'impact positif du programme sur les facteurs psychologiques, tout comme ses autres effets proximaux, sont considérés comme des facteurs favorables à une participation sociale et une qualité de vie optimales. Enfin, le modèle illustre également que les effets présumés du programme sur les chutes et les blessures associées aux chutes sont susceptibles d'avoir des retombées positives sur la participation sociale et la qualité de vie des participants. Les flèches reliant les divers concepts dans le schéma sont unidirectionnelles puisqu'elles représentent les effets escomptés du programme. Toutefois, il importe de souligner que certains des concepts indiqués ont en réalité une relation de réciprocité. Par exemple, tel que souligné dans la recension des écrits, un facteur psychologique comme la peur de chuter peut contribuer aux chutes, et réciproquement, les chutes peuvent induire ou aggraver la peur de chuter.

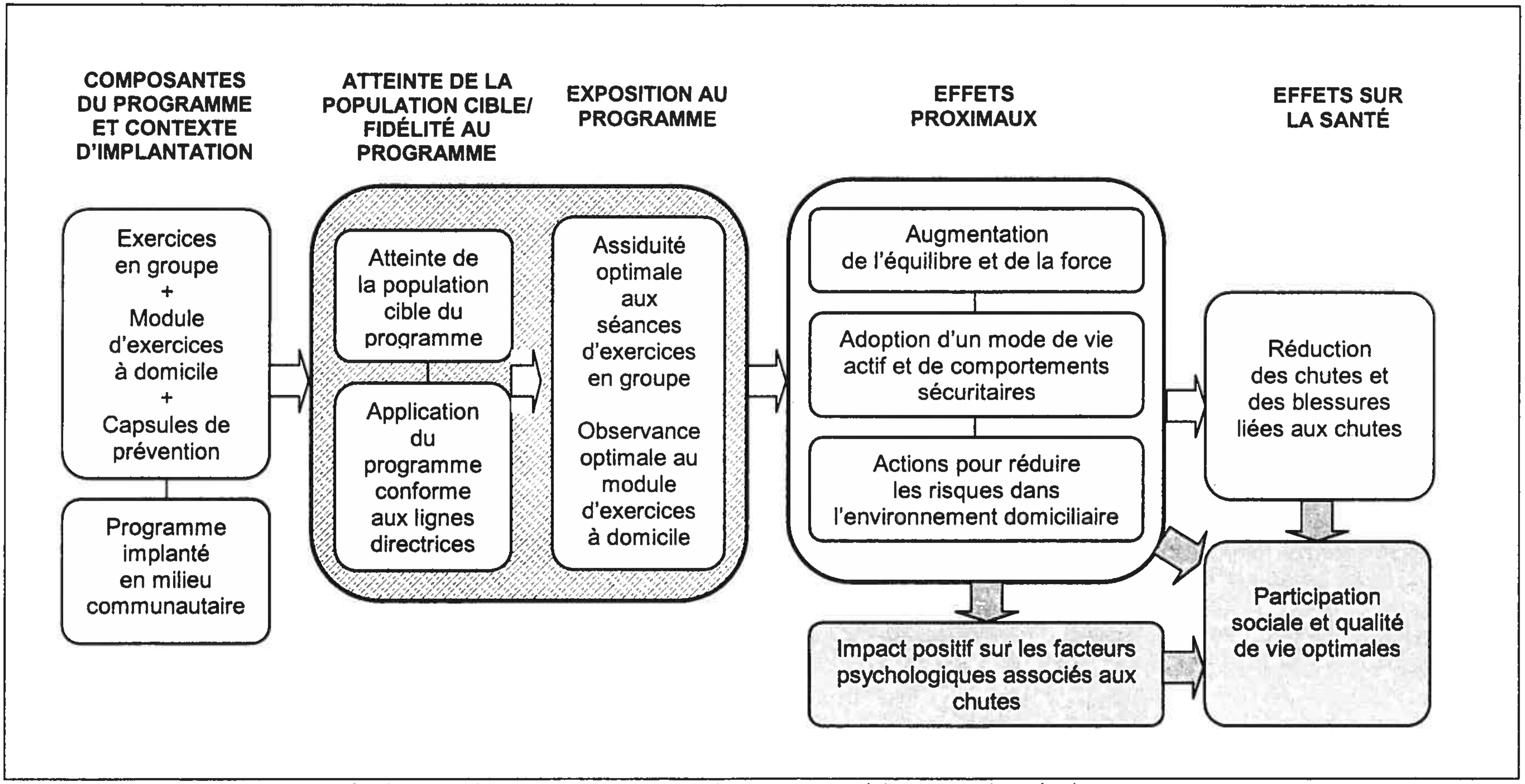


Figure 7. Version initiale du modèle logique du programme et amendement proposé (zones ombragées)
Traduit et adapté, avec la permission de l'éditeur de la revue *Canadian Journal on Aging*, de Filiatrault et al. (2007b). Implementing a community-based falls prevention program: from drawing board to reality. *Canadian Journal on Aging, 26*(3): 213-225.

3.4 Population à l'étude et procédures de recrutement

Afin de réaliser sa recherche évaluative, l'équipe de Dre Robitaille a lancé une invitation en 2001 aux représentants d'organismes du milieu communautaire de la région métropolitaine de Montréal et de ses environs qui avaient déjà manifesté un intérêt pour le programme. Il s'agissait principalement de CLSC et de centres communautaires pour aînés. Ces organismes étaient situés dans des villes et des banlieues de niveaux socioéconomiques variés. Tel que mentionné dans la section sur le devis de recherche, l'étude principale visait à évaluer l'impact du programme PIED lorsqu'il était offert par les organismes du milieu communautaire. Ainsi, les organismes dits « expérimentaux » étaient chargés du recrutement des aînés et ils devaient également offrir le programme. Quant aux organismes dits « témoins », ils avaient pour mandat de recruter des aînés qui constituaient la population cible du programme mais qui n'allaient participer qu'au protocole d'évaluation pendant la période expérimentale d'une durée de 12 mois. Par souci d'équité, ces aînés se voyaient offrir de participer au programme à la fin de l'étude. Des représentants de dix organismes communautaires ont donné leur accord pour offrir le programme dans leur communauté et recruter des participants pour les groupes expérimentaux. Les représentants de sept organisations ont accepté de recruter des participants pour les groupes témoins.

Les critères d'inclusion pour l'étude d'efficacité étaient les suivants : 1) être âgé de 60 ans et plus; 2) être capable de participer à un programme d'exercices en groupe; 3) être capable de communiquer en français ou en anglais. Les critères d'exclusion comprenaient la présence de maladies dégénératives ou de conditions invalidantes et la présence de déficits cognitifs. De plus, les représentants des organismes communautaires étaient invités à recruter des personnes qui présentaient les caractéristiques de la population cible du programme, à savoir des personnes qui présentaient au moins l'un des critères suivants : 1) avoir fait une ou plusieurs chutes au cours des 12 mois précédents; 2) avoir peur de chuter; et 3) être préoccupé par son équilibre. On invitait les représentants des organismes à utiliser des mots-clés tels que « chutes », « équilibre », « force », « os en santé » et « exercices » pour faire la promotion du programme et attirer ainsi les personnes âgées représentant la population cible du programme PIED.

Afin de s'assurer que les participants répondaient aux critères de l'étude, les représentants chargés du recrutement des participants dans les organismes ont procédé à de courtes entrevues téléphoniques avec chacun des candidats intéressés. Ces entrevues permettaient également de dépister les personnes susceptibles de présenter des contre-indications à participer à un programme d'exercices comme celui du programme PIED. Une grille d'aptitude aux exercices (voir exemplaire à l'annexe 2) permettait aux représentants de décider si les candidats étaient admissibles ou non au programme PIED (et donc au projet de recherche) ou si une autorisation médicale était requise au préalable. Quant aux troubles cognitifs, ceux-ci pouvaient faire l'objet d'un dépistage lors de cette brève entrevue. Il était toutefois prévu que les interviewers chargés de la collecte de données pour l'étude principale administrent en cas de doute le *Short Portable Mental Status Questionnaire* (Pfeiffer, 1975), afin de s'assurer de l'absence de troubles cognitifs. Au total, 200 personnes âgées de 60 ans et plus ont été recrutées par les organismes du milieu communautaire et se sont présentées à l'évaluation initiale, soit 98 personnes pour constituer le groupe expérimental et 102 personnes pour constituer le groupe témoin.

3.5 Procédures de collecte de données

Deux modes d'évaluation ont été utilisés pour la collecte de données à chacun des temps de l'évaluation: des entrevues structurées menées en face à face et l'administration d'une batterie de tests d'équilibre. L'entrevue était faite à l'aveugle par des interviewers qui avaient été préalablement formés. Ceux-ci ont colligé des données sur le profil sociodémographique des participants, de même que des données relatives à divers aspects dont la santé physique, la santé psychologique, l'activité physique, l'histoire de chutes, la peur de chuter, l'équilibre perçu et la confiance en son équilibre. Quant aux tests d'équilibre, ceux-ci ont également été administrés à l'aveugle par des physiothérapeutes ayant préalablement reçu une formation. La durée approximative totale de chaque évaluation était de 2 heures. Les évaluations se sont déroulées dans des organismes communautaires du quartier des participants. Au total, sept interviewers et seize physiothérapeutes ont participé à la collecte de données. Les évaluations ont été réalisées à l'entrée dans l'étude et ont été répétées à trois autres moments. Tel que mentionné précédemment, les données colligées aux évaluations réalisées à l'entrée dans l'étude (T1) et à la fin du programme, soit trois mois plus tard (T2), ont été utilisées dans le cadre de cette thèse.

3.6 Variables

3.6.1 Construits psychologiques étudiés

Les variables à l'étude dans la thèse correspondent à deux construits psychologiques associés aux chutes, soit la confiance en son équilibre et l'équilibre perçu. La confiance des aînés en leur équilibre a été évaluée à l'aide d'une version modifiée de l'échelle ABC (Powell et Myers, 1995). L'échelle ABC est un questionnaire permettant d'évaluer le degré de confiance de la personne en son équilibre lors de tâches motrices réalisées dans l'environnement domiciliaire et communautaire. Toutefois, tel que mentionné dans la recension des écrits, des modifications ont été apportées à l'outil original après avoir identifié un certain nombre de lacunes. L'échelle modifiée, désignée échelle ABC-Simplifiée (ABC-S), se veut plus conviviale pour les répondants grâce aux changements apportés à la question de départ, de même qu'à l'échelle de réponses. De plus, un item de l'outil original a été retiré afin d'assurer une plus grande consistance de l'échelle avec les stratégies de prévention des chutes préconisées par la santé publique. Les items de l'outil, de même que sa question de départ et son échelle de réponses sont présentés au tableau I.

L'étude des propriétés psychométriques de l'échelle ABC-S est l'un des principaux objectifs de cette thèse. Les détails concernant la méthodologie et les résultats de cette étude sont présentés au chapitre 6 sous forme d'un article qui est paru en mai 2007 dans la revue *Archives of Physical Medicine and Rehabilitation*. En résumé, l'étude atteste que l'échelle ABC-S présente une bonne consistance interne (coefficient de fidélité de 0,86) et une bonne validité concomitante démontrée par des associations significatives entre la confiance en son équilibre et les scores obtenus à une série d'épreuves d'équilibre, l'équilibre perçu, la peur de chuter et l'histoire de chutes survenues au cours des 12 derniers mois (Filiatrault et al., 2007a).

Le questionnaire ABC-S a également été traduit en français pour les participants francophones. Le processus de traduction a sollicité la collaboration de cinq experts francophones (des chercheurs et des professionnels de la réadaptation et de l'activité physique) impliqués activement dans le domaine de la prévention des chutes. Les experts étaient tous bilingues. Le processus de traduction est également décrit dans l'article présenté au chapitre 6.

Le deuxième construit psychologique considéré dans cette thèse est l'équilibre perçu. Celui-ci a été mesuré à l'aide d'un seul énoncé « Sur l'échelle suivante, montrez comment vous considérez votre niveau d'équilibre ». Une échelle de réponses de type Likert allant de 1 (pauvre équilibre) à 10 (excellent équilibre) était présentée aux participants. À notre connaissance, c'est la première fois qu'une telle mesure est utilisée dans des recherches évaluatives en prévention des chutes. Son intérêt est de permettre d'examiner si un changement observé dans l'équilibre objectif des participants se traduit par des changements similaires dans l'appréciation subjective de son équilibre. Une étude de validation initiale a démontré que cette mesure est significativement associée aux scores obtenus pour un ensemble d'épreuves d'équilibre (Filiatrault, Robitaille, Gauvin, Laforest, Parisien, Fournier et Richard, 2004).

3.6.2 Autres variables

L'appartenance de chaque participant à son groupe (expérimental ou témoin) est la variable indépendante considérée pour répondre au but de cette thèse. Les autres variables prises en compte incluent des variables sociodémographiques (âge, sexe, niveau de scolarité, perception de sa situation économique, conditions de vie), la peur de chuter, l'histoire de chutes, la santé perçue, la consommation de médicaments associés aux chutes, la santé psychologique et l'équilibre objectif. Les variables considérées, les méthodes d'évaluation et leur source respective sont indiquées au tableau I. Le lecteur est invité à se référer au chapitre 6 pour des détails supplémentaires au sujet des épreuves d'équilibre.

Tableau I. Variables considérées dans la thèse et méthodes d'évaluation utilisées

Variables	Méthodes d'évaluation (sources)
Confiance en son équilibre	*ABC-S (Filiatrault et al., 2007a; adapté et traduit de Powell et Myers, 1995)* *Jusqu'à quel point êtes-vous confiant(e) de garder votre équilibre lorsque vous faites les activités suivantes ?* - *Vous balayez le plancher* - *Vous sortez de la maison pour aller vers une auto stationnée dans l'entrée* - *Vous vous étirez pour prendre une petite boîte de conserve sur une étagère, à la hauteur des yeux* - *Vous marchez dans la maison* - *Vous utilisez un escalier roulant en tenant la rampe* - *Vous traversez un terrain de stationnement pour vous rendre au centre commercial* - *Vous montez ou descendez de l'auto (régulière)* - *Vous marchez dans le centre commercial bondé de gens pressés* - *Vous vous penchez pour ramasser une pantoufle, sur le plancher de votre garde-robe* - *Vous montez ou descendez un plan incliné (rampe d'accès)* - *Vous montez ou descendez les escaliers* - *Vous êtes bousculé(e) par des gens en marchant dans le centre commercial* - *Vous vous tenez sur la pointe des pieds pour aller chercher un objet, au-dessus de votre tête* - *Vous êtes monté(e) sur une chaise (ou un escabeau) pour aller chercher un objet* - *Vous utilisez un escalier roulant sans pouvoir tenir la rampe parce que vous avez les bras chargés de paquets* *Échelle de réponses de 0 à 3 pour chacun des items. Score global de 0 à 45.*
Équilibre perçu	*Question: « Sur l'échelle suivante, montrez comment vous considérez votre niveau d'équilibre? » (question développée par l'équipe; Filiatrault et al., 2004)* *Échelle de 1 à 10 (1 = équilibre très pauvre et 10 = excellent équilibre)*
Appartenance au groupe	-----
Caractéristiques socio-démographiques	
Sexe	-----
Âge	*« Quelle est votre date de naissance ? »*
Scolarité	*« Quel est le plus haut niveau de scolarité que vous avez complété ? »* *1) primaire non complété* *2) primaire complété* *3) secondaire non complété* *4) secondaire complété* *5) collège non complété* *6) collège complété* *7) université non complétée* *8) université complétée*

Tableau I. Variables considérées dans la thèse et méthodes d'évaluation utilisées (suite)

Variables	Méthodes d'évaluation (source)
Caractéristiques socio-démographiques	
Perception de sa situation économique	*« Comment percevez-vous votre situation économique par rapport aux gens de votre âge ? »* *1) vous vous considérez à l'aise financièrement* *2) vous considérez vos revenus suffisants pour répondre à vos besoins* *3) vous vous considérez pauvre* *4) vous vous considérez très pauvre*
Condition de vie (vit seul ou non)	*Vous incluant, combien de personnes demeurent dans votre logement?*
Équilibre objectif	*Épreuve unipodale - yeux ouverts, yeux fermés, côté droit, côté gauche (score en secondes) (Gehlson et Whaley, 1990)* *Épreuve du tandem (score en secondes) (Heitman, Gossman, Shaddeau et Jackson, 1989)* *Marche en tandem (score en secondes) (Baloh, Fife, Zwerling, Socotch, Jacobson, Bell et Beykirch, 1994)* *Functional reach (score en centimetres) (Duncan, Weiner, Chandler et Studenski, 1990)* *Lateral reach - côté droit et côté gauche (score en centimètres) (Brauer, Burns et Galley, 1999)*
Peur de chuter	*Avez-vous peur de tomber ? (question développée par l'équipe)* *1) très souvent* *2) souvent* *3) occasionnellement* *4) jamais*
Chutes	*« Combien de fois avez-vous chuté au cours de la dernière année ? » (O'Loughlin et al., 1993)*
Santé perçue	*Question « Comparativement à d'autres personnes de votre âge, diriez-vous que votre santé est en général… » (Questionnaire sur les habitudes de vie et la santé, Santé Québec (1998); Enquête sur la santé dans les collectivités canadiennes (2000), Statistique Canada)* *1) Excellente* *2) Très bonne* *3) Bonne* *4) Moyenne* *5) Mauvaise*

Tableau I. Variables considérées dans la thèse et méthodes d'évaluation utilisées (suite)

Variables	Méthodes d'évaluation (source)
Consommation de médicaments associés aux chutes	*Question : « Hier ou avant-hier, avez-vous consommé les médicaments suivants (prescrits ou non)? » (question inspirée du Questionnaire sur les habitudes de vie et la santé (1998), Santé Québec)* *Pour l'analyse, seule la consommation de médicaments susceptibles d'influencer l'équilibre a été considérée (ex. : psychotropes, hypertenseurs)*
Santé psychologique	*Sous-échelle santé psychologique du Short Form Health Survey (SF-36) (Ware, Snow et Kosinski, 2000)* *Au cours de la semaine dernière, combien de fois :* *- Avez-vous été très nerveux(se)?* *- Vous êtes-vous senti(e) si déprimé(e) que rien ne pouvait vous remonter le moral?* *- Vous êtes-vous senti(e) calme et serein(e)?* *- Vous êtes-vous senti(e) triste et abattu(e)?* *- Vous êtes-vous senti(e) heureux(se)?* *Échelle de 1à 6; étiquettes descriptives : Tout le temps – 7 jours, La plupart du temps – 6 à 7 jours, Souvent – 4 à 5 jours,...). Score global de 0 à 25, ramené en pourcentage.*

3.7 Procédures d'analyse

3.7.1 Étude des propriétés psychométriques de l'échelle ABC-S

Recodage des variables

Les variables colligées à l'entrée dans l'étude (T1) ont été utilisées pour l'étude psychométrique. La variable d'intérêt était la confiance en son équilibre telle que mesurée avec l'échelle ABC-S. Les scores individuels obtenus de 0 à 3 pour chacun des items de l'échelle ABC-S ont été utilisés tels quels pour les analyses.

Les variables suivantes ont permis d'examiner la validité concomitante de l'outil : la peur de chuter, l'équilibre perçu, l'équilibre objectif de la personne tel que mesuré à l'aide d'une série d'épreuves d'équilibre (voir tableau I) et l'histoire de chutes. Certaines variables ont été incluses à titre de variables de contrôle soit l'âge, le sexe, le niveau d'éducation et la perception de ses conditions économiques.

La peur de chuter et l'histoire de chutes au cours des 12 derniers mois ont été dichotomisées : peur de chuter (0 = souvent ou très souvent; 1 = occasionnellement ou jamais peur), chutes (0 = une chute ou plus; 1 = pas de chute). L'équilibre perçu et les scores obtenus aux épreuves d'équilibre ont été transformés en tertiles (1 = tertile inférieur; 2 = tertile moyen; 3 = tertile supérieur). Les variables démographiques ont été transformées en variables à trois catégories de la manière suivante: niveau d'éducation (1 = élémentaire; 2 = secondaire; 3 = collégial et universitaire); perception de ses conditions économiques (1 = se considère pauvre ou très pauvre; 2 = considère ses revenus suffisants pour répondre à ses besoins; 3 = se considère à l'aise financièrement); et âge (1 = tertile inférieur; 2 = tertile moyen; 3 = tertile supérieur). Des variables artificielles (« *dummy variables* » en anglais) ont été créées pour représenter les variables catégorielles en vue des analyses statistiques.

Statistiques descriptives

Les statistiques descriptives usuelles ont été utilisées pour obtenir un portrait de l'échantillon de l'étude. Des proportions ont aussi été calculées pour chacune des catégories de réponses à chacun des items de l'échelle ABC-S. Par la suite, une série d'analyses particulières ont été réalisées pour examiner les propriétés psychométriques de l'échelle, à savoir sa consistance interne et sa validité concomitante. Ces analyses, décrites dans la section suivante, ont également permis d'examiner la hiérarchie de l'échelle.

Analyses multiniveaux à l'aide de modèles IRT polytomiques

Comme les méthodes proposées par la théorie classique de la mesure pour étudier les propriétés psychométriques d'un instrument s'avèrent plus ou moins optimales pour des échelles de réponses catégorielles, l'étude a été réalisée à l'aide des méthodes proposées par la théorie des réponses aux items (IRT). Plus précisément, un modèle IRT polytomique connu sous le nom de modèle de réponses graduées de Samejima a été sélectionné étant donné le contexte de mesure d'un trait latent à l'aide de réponses données pour une série d'items, sur une échelle catégorielle ordonnée. Un tel modèle est basé sur la présomption que la réponse à un item n'est pas seulement fonction du trait latent évalué mais est également fonction du niveau de difficulté de l'item.

Une autre particularité méthodologique de cette étude est d'avoir eu recours aux méthodes multiniveaux (Raudenbush et Bryk, 2002). Ces méthodes portent une attention particulière à la structure imbriquée des données et de la variabilité. Ces modèles ont d'abord été appliqués dans les études où les chercheurs souhaitaient prendre en considération l'effet du contexte. Dans ce type d'application, les individus sont vus comme étant imbriqués dans des milieux. Les méthodes d'analyse multiniveaux ont par la suite été utilisées pour d'autres applications, notamment l'évaluation des propriétés psychométriques d'instruments de mesure comportant plusieurs items. Ainsi, les réponses aux items d'un instrument de mesure comme l'échelle ABC-S sont vues comme des unités de niveau 1 imbriquées dans des individus, lesquels constituent des unités de niveau 2 (figure 8).

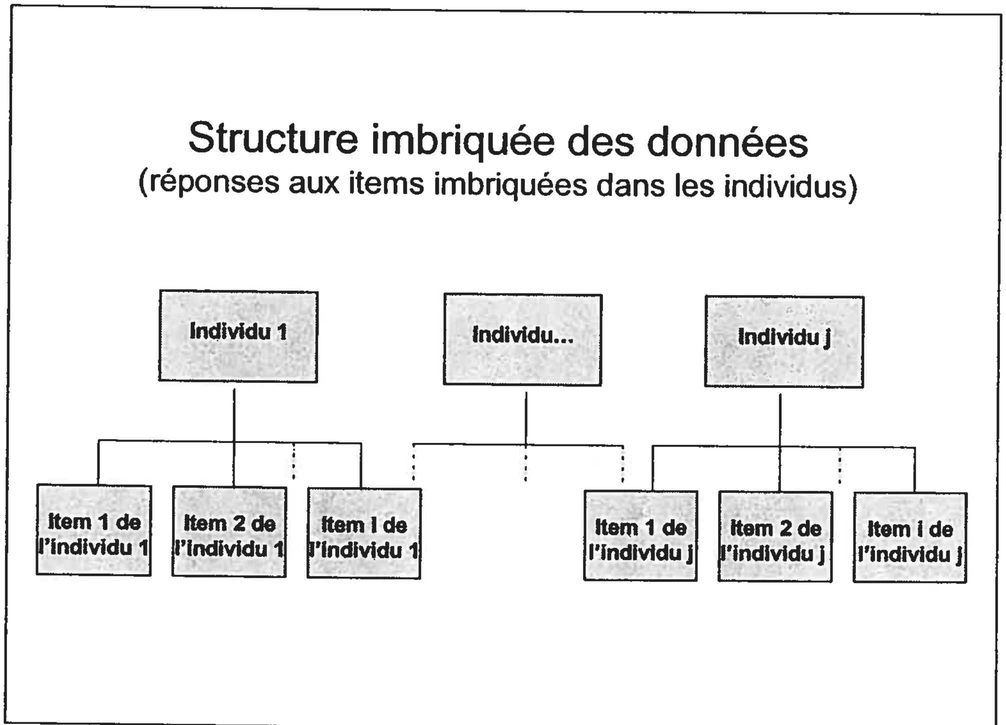


Figure 8. Structure imbriquée des données dans l'étude des propriétés psychométriques de l'échelle ABC-S

Les analyses multiniveaux ont été réalisées en quatre étapes. En premier lieu, un modèle incluant seulement les réponses individuelles à chacun des items de l'échelle, ainsi qu'un paramètre représentant un effet aléatoire a permis de déterminer si la variabilité interindividuelle dans la confiance en son équilibre (le construit latent) était significative. Deuxièmement, des variables artificielles (« *dummy* ») ont été créées pour différencier 14 des 15 items de l'échelle ABC-S et ont été entrées simultanément dans le modèle comme prédicteurs de niveau 1. Le 2^{e} item de l'outil (soit, monter et descendre les escaliers) a été choisi comme catégorie de référence, cette tâche étant vue comme représentative du niveau de mobilité attendu chez des aînés autonomes vivant à domicile. Les coefficients de régression associés aux variables artificielles des 14 autres items ont permis de produire un estimé d'un index de fidélité reflétant la consistance interne de l'échelle. Ces coefficients ont également permis d'établir la hiérarchie des items de l'échelle. Troisièmement, un modèle incluant des variables de contrôle, soit l'âge, le sexe, le niveau de scolarité et la perception de sa condition économique a été ajusté. Ceci a été réalisé en incluant dans le modèle les variables artificielles associées à chacune des variables de contrôle à titre de variables de niveau 2 modifiant l'intercept. Enfin, la dernière étape de l'analyse a permis d'ajuster des modèles multiniveaux qui incluaient alternativement les variables artificielles associées à : 1) l'équilibre perçu; 2) les scores obtenus aux épreuves d'équilibre; 3) la peur de chuter; ou 4) les chutes survenues au cours des 12 mois précédents. À nouveau, les variables artificielles représentant chacune de ces variables étaient incluses dans le modèle à titre de variables de niveau 2 pouvant modifier l'intercept. Cette dernière étape a permis d'examiner les associations entre chacune des variables incluses dans le modèle et le construit latent étudié (confiance en son équilibre), fournissant par le fait même des évidences de la validité concomitante de l'outil.

L'un des avantages des analyses multiniveaux est de permettre une utilisation maximale des données. Contrairement aux méthodes de régression traditionnelles, ces techniques permettent d'utiliser les résultats des participants qui n'auraient pas donné de réponses pour certains items. Le logiciel HLM6.0 a été utilisé pour effectuer les analyses multiniveaux.

Analyses complémentaires

Une série d'analyses additionnelles ont été réalisées pour examiner le rôle potentiellement confondant des problèmes de santé associés aux chutes (ex. : étourdissements, problèmes visuels, incontinence urinaire). Des modèles multiniveaux ont alors été ajustés en incluant une variable artificielle contrastant les participants avec ou sans problème de santé associé aux chutes. Une procédure semblable a été suivie pour contrôler pour la langue dans laquelle le questionnaire ABC-S a été administré (anglais ou français).

3.7.2 Étude des effets du programme PIED sur les facteurs psychologiques associés aux chutes

Transformation et recodage des variables

L'étude évaluative avait comme objectif d'évaluer l'impact du programme PIED sur deux facteurs psychologiques associés aux chutes, soit la confiance en son équilibre et l'équilibre perçu. Ces deux variables constituaient donc les variables dépendantes de l'étude. Les données colligées à l'entrée dans l'étude (T1) et immédiatement après le programme (T2) ont été utilisées pour ces deux variables. Pour la confiance en son équilibre, un score global a été compilé en additionnant les scores obtenus aux items de l'échelle ABC-S et en ramenant celui-ci en pourcentage. Comme la distribution des scores globaux présentait une certaine asymétrie (une plus grande concentration de scores élevés de confiance en son équilibre), les scores globaux bruts ont été transformés en utilisant leur racine carrée. Les réponses compilées pour la deuxième variable dépendante, soit l'équilibre perçu, ont été utilisées telles quelles car leur distribution était normale.

L'appartenance au groupe (0 = témoin; 1 = expérimental) est la variable indépendante de cette étude. Les autres variables considérées pour l'étude évaluative sont des variables de contrôle. Ces variables regroupaient les caractéristiques sociodémographiques (âge, sexe, niveau de scolarité, perception de ses conditions économiques et conditions de vie), l'histoire de chutes, la santé perçue, la consommation de médicaments associés aux chutes, le bien-être psychologique et l'équilibre objectif. Les données colligées pour l'âge, le bien-être psychologique et l'équilibre ont été utilisées telles quelles, sans transformation. Le niveau de scolarité, la perception de sa situation économique et de sa santé ont été transformées en variables à trois catégories de la manière suivante: niveau de scolarité (1 = élémentaire; 2 = secondaire; 3 = collégial et universitaire), perception de ses conditions économiques (1 = se considère pauvre ou très pauvre; 2 = considère ses revenus suffisants pour répondre à ses besoins; 3 = se considère à l'aise financièrement) et perception de sa santé (1 = tertile inférieur; 2 = tertile moyen; 3 = tertile supérieur). Des variables artificielles ont été créées pour les variables catégorielles en vue des analyses.

Les conditions de vie, l'histoire de chutes au cours des 12 derniers mois et la consommation de médicaments associés aux chutes ont été dichotomisées : conditions de vie (0 = vit seul; 1 = vit avec une ou plusieurs personnes), chutes (0 = pas de chute; 1 = une chute ou plus), médicaments (0 = ne prend pas de médicament associé aux chutes; 1 = prend au moins un médicament associé aux chutes).

Toutes les variables de contrôle correspondaient au profil des participants à leur entrée dans l'étude (T1), à l'exception du changement dans l'équilibre des participants qui impliquait les mesures colligées à la fois au pré-test et au post-test.

Analyses descriptives et analyses bivariées

Les statistiques usuelles ont été utilisées pour décrire le profil des participants, à la fois pour l'échantillon total et pour chacun des groupes. Des analyses bivariées ont été réalisées à l'aide de tests de t de Student et de tests de chi-carré afin de comparer les participants du groupe expérimental et ceux du groupe témoin. Des analyses bivariées ont également été réalisées pour comparer les participants n'ayant pas participé au post-test avec les participants étant demeurés dans l'étude.

Analyses multivariées

Le principe de l'analyse en intention de traiter (« intention-to-treat ») a été utilisé pour examiner l'impact du programme sur la confiance en son équilibre et sur l'équilibre perçu. Les analyses multivariées ont été réalisées à l'aide de trois séries de modèles de régression linéaire, soit une série pour chacune des variables dépendantes suivantes : 1) confiance en son équilibre (scores bruts); 2) confiance en son équilibre (scores transformés); et 3) équilibre perçu (scores bruts).

Toutes les analyses de régression linéaires ont été réalisées selon les cinq étapes suivantes : 1) inclusion de la variable correspondant à l'appartenance au groupe (variable indépendante) et des scores initiaux pour la confiance en son équilibre ou pour l'équilibre perçu (modèle #1); 2) ajout des variables sociodémographiques (âge, sexe, niveau de scolarité, perception de sa condition économique, conditions de vie) (modèle #2); 3) ajout de l'histoire de chutes et des variables de santé (santé perçue, consommation de médicaments associés aux chutes, bien-être psychologique) (modèle #3); ajout d'un score de changement résidualisé pour chacune des épreuves d'équilibre entre le pré-test et le post-test visant à évaluer si l'ampleur des changements dans l'équilibre des aînés suite à l'intervention était associée aux changements dans les facteurs psychologiques associés aux chutes (modèle #4); et 5) ajout de termes d'interaction pour tester des effets de sous-groupes (modèle #5). Les changements résidualisés aux épreuves d'équilibre ont seulement été considérés dans le cas des épreuves d'équilibre pour lesquelles des effets significatifs du programme avaient été notés dans l'étude principale (voir étude de Robitaille et al. (2005) à l'annexe 1), soit : 1) l'épreuve unipodale, yeux ouverts, côté droit; 2) l'épreuve unipodale, yeux ouverts, côté gauche; 3) l'épreuve unipodale, yeux fermés, côté gauche; 4) l'épreuve du tandem; et 5) la marche en tandem. Les scores résidualisés pour chacune des épreuves d'équilibre ont été entrés dans des modèles distincts afin de faire une utilisation optimale des données en évitant d'éliminer des cas pour lesquels il manquait un ou quelques scores d'équilibre. Toutes les analyses ont été effectuées à l'aide du logiciel SPSS (version 11.5).

3.8 Considérations éthiques

Le protocole de recherche de l'étude principale a reçu l'approbation du comité d'éthique de la Régie régionale de la Santé et des Services sociaux en novembre 2001 (voir annexe 3). Le projet de doctorat a quant à lui reçu l'approbation du comité d'éthique de la DSP de Montréal en 2004 (voir annexe 4). Les participants de l'étude ont tous été recrutés sur une base volontaire. Ils ont d'abord consenti verbalement à participer à l'étude lors d'un entretien téléphonique avec un représentant d'un organisme communautaire. Leur consentement écrit a ensuite été obtenu au moment de l'évaluation initiale à T1 (voir formulaires de consentement pour les participants des groupes expérimentaux et des groupes témoins à l'annexe 5). Les formulaires de consentement ont également permis d'expliquer aux participants la nature du projet de recherche et de leur participation. Les participants du groupe expérimental ont aussi été informés des risques potentiels associés au fait de faire de l'exercice en groupe 2 fois par semaine. Tous les participants ont été avisés du caractère confidentiel des données recueillies. Les questionnaires utilisés pour la collecte des données ont été dépersonnalisés et conservés sous clé en tout temps. Les interviewers, les physiothérapeutes responsables de l'administration des épreuves d'équilibre et les animateurs ont tous signé un formulaire d'engagement à la confidentialité.

CHAPITRE 4 -

THE IMPACT OF PREVENTIVE INTERVENTIONS OFFERED TO COMMUNITY-DWELLING SENIORS ON FALLS-RELATED PSYCHOLOGICAL FACTORS: A REVIEW (ARTICLE 1)

Johanne Filiatrault, erg., M.Sc., doctorante

Lise Gauvin, Ph.D.

Sophie Laforest, Ph.D.

Yvonne Robitaille, Ph.D.

Lucie Richard, Ph.D.

Hélène Corriveau, pht., Ph.D.

Article soumis pour publication à la revue

Preventive Medicine

Contribution des auteurs

Titre de l'article:

The impact of preventive interventions offered to community-dwelling seniors on falls-related psychological factors: A review

Johanne Filiatrault était responsable de la revue systématique des études, de l'analyse et de la rédaction de l'article.

Lise Gauvin a soutenu l'étudiante dans sa démarche et a collaboré à la rédaction.

Sophie Laforest a contribué à la validation des données extraites de la littérature et a collaboré à la rédaction de l'article.

Yvonne Robitaille a collaboré à la rédaction de l'article.

Lucie Richard a soutenu l'étudiante dans sa démarche et a collaboré à la rédaction.

Hélène Corriveau a contribué à la rédaction de l'article.

Accord des coauteurs

Johanne Filiatrault a obtenu l'accord des coauteurs d'inclure l'article intitulé

« The impact of preventive interventions

offered to community-dwelling seniors

on falls-related psychological factors: A review »

dans cette thèse de doctorat (voir formulaire à l'annexe 6).

THE IMPACT OF PREVENTIVE INTERVENTIONS OFFERED TO COMMUNITY-DWELLING SENIORS ON FALLS-RELATED PSYCHOLOGICAL FACTORS: A REVIEW

Johanne Filiatrault, O.T., M.Sc., Lise Gauvin, Ph.D., Sophie Laforest, Ph.D., Yvonne Robitaille, Ph.D., Lucie Richard, Ph.D., and Hélène Corriveau, P.T., Ph.D.

Institutional affiliations:

From École de réadaptation, Université de Montréal, Montreal, QC, Canada (Filiatrault); Institut national de santé publique du Québec, Montreal, QC, Canada (Filiatrault, Robitaille); Programme de doctorat en santé publique, Université de Montréal, Montreal, QC, Canada (Filiatrault); Groupe de recherche interdisciplinaire en santé (GRIS), Montreal, QC, Canada (Filiatrault, Gauvin, Laforest, Richard); Département de médecine sociale et préventive, Université de Montréal, Montreal, QC, Canada (Gauvin, Robitaille); Centre de recherche Léa-Roback sur les inégalités sociales de santé de Montréal, Montreal, QC, Canada (Gauvin, Richard); Département de kinésiologie, Université de Montréal, Montreal, QC, Canada (Laforest); Centre de santé et de services sociaux Cavendish-Centre affilié universitaire en gérontologie sociale, Montreal, QC, Canada (Laforest); Department of Epidemiology and Biostatistics, McGill University, Montreal, QC, Canada (Robitaille); Faculté des sciences infirmières, Université de Montréal, Montreal, QC, Canada (Richard); Centre de recherche de l'Institut universitaire de gériatrie de Montréal, Montreal, QC, Canada (Richard); Département de réadaptation, Université de Sherbrooke, Sherbrooke, QC, Canada (Corriveau); Centre de recherche sur le vieillissement, Institut universitaire de gériatrie de Sherbrooke, Sherbrooke, QC, Canada (Corriveau).

All communications and reprint requests should be addressed to:

Johanne Filiatrault, O.T., M.Sc., Ph.D.(C)

Address : Université de Montréal, Faculté de médecine, École de réadaptation,

C.P. 6128, succursale Centre-ville, Montreal, QC, Canada, H3C 3J7.

Phone number : (514) 343-6111 (ext. 0836); Fax number : (514) 343-2105

[redacted]

ABSTRACT

Objectives: To establish the impact of preventive interventions offered to community-dwelling seniors on fear of falling, falls efficacy, and balance confidence and to describe intervention features as a function of strategies, content, and delivery processes.

Method: Relevant studies were identified by searching five electronic databases, by manually searching reference lists of relevant papers, and by probing experts working in the falls prevention domain.

Results: A total of 31 studies meeting inclusion and exclusion criteria were identified. Systematic examination of study findings revealed evidence of the benefits of community-based Tai Chi programs delivered in groups on the three falls-related psychological factors. There was also evidence that multifaceted home-based interventions including exercise and educational components addressing several falls risk factors can improve falls efficacy. Home-based individualized exercise interventions also appear successful in improving falls efficacy and in decreasing fear of falling.

Conclusion: This review supports the idea that falls-related psychological factors are amenable to change among community-dwelling seniors. More research is needed on the impact of preventive interventions, and more specifically community-based group interventions that include balance exercises other than Tai Chi programs, on falls-related psychological outcomes.

MeSH Key Words: Psychological factors, Accidental falls, Prevention, Aged, Systematic review.

INTRODUCTION

Falls prevention among seniors has been recognized for some times as an important public health issue (Marks and Allegrante, 2004). Falls prevention interventions typically include exercise and are multifactorial. Balance performance is frequently targeted as an outcome in these interventions since age-related changes in balance are recognized as one of the most important falls risks factors among seniors (Rubenstein, 2006). More recent research suggests that falls-related psychological factors such as fear of falling, balance confidence, and falls efficacy also constitute important intervention targets (Cumming et al., 2000; Delbaere et al., 2004; Zijlstra et al., 2007a; Zijlstra et al., 2007b). The relevance of these supplemental intervention features are supported by increasing evidence that fear of falling, low balance confidence or low falls efficacy can lead to activity avoidance and subsequently interfere with function and quality of life (Tinetti et al., 1994a; Mendes de Leon et al., 1996; Lachman et al., 1998; Cumming et al., 2000; Li et al., 2003). In fact, longitudinal studies show that fear of falling and falls efficacy are independent predictors of falls among community-dwelling seniors (Cumming et al., 2000; Friedman et al., 2002; Delbaere et al., 2004). Consequently, several authors have suggested that fear of falling and other falls-related psychological factors should be part of the public health agenda (Tinetti et al., 1994a; Lachman et al., 1998; Lach, 2002; Simpson and Jones, 2004) and a growing number of studies have examined the impact of community-based or home-based preventive interventions on falls-related psychological factors among community-dwelling seniors.

A recent review of 19 randomized controlled trials examining the impact of a diversity of preventive interventions on falls-related psychological factors showed evidence that these factors are amenable to change among community-dwelling seniors (Zijlstra et al., 2007b). Although extremely timely and useful, this review could be supplemented with additional relevant information for falls prevention research and intervention. First, in this previous review, several falls-related psychological outcomes were subsumed under a single umbrella construct (fear of falling). However, an increasing number of researchers argue that constructs such as fear of falling, balance confidence, and falls efficacy are not isomorphic (McAuley et al., 1997; Li et al., 2002; Jørstad et al., 2005) as some seniors report experiencing fear of falling despite feeling confident in their ability to perform activities without falling (Tinetti et al., 1994a). Corroborating this idea, one study showed that falls efficacy and fear of falling are only moderately correlated (Wilson et al., 2005). Therefore, it is plausible for an intervention to have an impact on one falls-related psychological factor, but limited or no impact on another (Cameron et al., 2000; Wilson et al., 2005). Consequently, in reviewing the literature, it seems imperative to stratify intervention impacts as a function of specific falls-related psychological factors.

Second, health promotion interventions designed for community-dwelling seniors are often complex and heterogeneous packages (Richard et al., In Press). Unfortunately, most reviews of intervention studies provide only superficial descriptions of interventions (Herbert and Bø, 2005). Although decomposing interventions into specific features (i.e., strategies, content, and delivery) is a daunting task, it is helpful for researchers and public health interventionists attempting to develop interventions that are well suited to specific contexts (Richard et al., In Press). For example, practitioners and public health policy-makers will likely find utility in being informed about interventions' strategies (e.g., exercise, education), content (e.g., types of exercise, educational topics addressed), approach (e.g., group, individual), professional background of interventionists (e.g., occupational therapist, physical therapist, or nurse), and setting (e.g., home, community). Finally, the literature on randomized trials and community-based initiatives of falls prevention interventions is expanding at an accelerated pace (Close, 2005). Therefore, literature compendia must be broadly and frequently updated.

In light of the previous considerations, the current review had two specific aims: 1) to establish the impact of preventive interventions offered to community-dwelling seniors on three falls-related psychological factors namely, fear of falling, falls efficacy, and balance confidence; and 2) to describe intervention features as a function of strategies, content, and delivery processes. In order to provide an appropriate conceptual backdrop to the review, the following paragraphs outline distinctions across the three falls-related psychological factors.

Distinctions Between Three Falls-Related Psychological Constructs

Fear of falling, balance confidence, and falls efficacy are the three most frequently measured falls-related psychological constructs (Jørstad et al., 2005). Fear of falling refers to a pronounced and ubiquitous apprehension about sustaining a fall and is typically ascertained with a single question (i.e., "Are you afraid of falling?"). The measure has been criticized for being blunt since the dichotomous response scale (yes/no) can easily result in false positives and false negatives. Other biases can emerge because of its potential association with phobias (Tinetti et al, 1990).

Couched within self-efficacy theory (Bandura, 1977), falls efficacy refers to a person's confidence in his/her ability to perform activities of daily living without falling. In keeping with this conceptualization, the Falls Efficacy Scale (FES) - developed by Tinetti, Richman, and Powell (1990) - requires respondents to rate their degree of confidence, on a 0 to 100 scale, in performing 10 activities of daily living (e.g., get in and out of bed, take a bath or shower). Although the FES has shown good convergent and predictive validity, as well as good reliability (Tinetti et al., 1990; Tinetti et al, 1994a; Cumming et al., 2000), it is subject to ceiling effects when used with high functioning community-dwelling seniors. To address this problem, Powell and Myers developed another instrument known as the Activities-specific Balance Confidence (ABC) Scale (Powell and Myers, 1995). Balance confidence, is more specific than falls efficacy as it refers to a person's confidence in his/her balance (rather than confidence in avoiding a fall) in a variety of daily tasks performed in the household and in the community (e.g., walk up and down stairs, get in and out of car). The ABC scale includes a larger number of items than the FES scale and has a wider range of item difficulty (Powell and Myers, 1995). The convergent validity and internal consistency reliability of the original ABC Scale, as well as modified and translated versions of the scale have been established for community-dwelling seniors (Powell and Myers, 1995; Myers et al., 1998; Parry et al., 2001; van Heuvelen et al., 2005; Filiatrault et al., 2007).

Even though fear of falling, falls efficacy, and balance confidence all refer to psychological constructs pertaining to the theme of accidental falls, they are not isomorphic (McAuley et al., 1997; Li et al., 2002; Jørstad et al., 2005). As mentioned by Yardley (2004), fear of falling is an imprecise concept that can be enmeshed with an overall trait of fearfulness. Fear of falling can also refer to a range of more specific fears such as the fear of pain associated with an anticipated injury, the fear of not being able to get up after a fall, the fear of social embarrassment, the fear of loosing independence or the fear of hospitalization or institutionalization (Yardley and Smith, 2002). By contrast, falls efficacy and balance confidence as measured with the FES and ABC Scale, are not traits as they are situation-specific (i.e., seniors must refer to specific tasks or activities of daily living to provide their answers). This might explain why a concept such as falls efficacy is a better predictor of functioning in activities of daily living than fear of falling (Mendes de Leon et al., 1996). Furthermore, fear of falling is framed within the eventuality of a *future* event whereas balance confidence and falls efficacy are framed within perceptions of one's *current* capabilities.

Even though the concepts of falls efficacy and balance confidence share commonalities, we argue that there are some distinctions between them which should be highlighted. For instance, we hypothesize that people rely on different cues in responding to scales measuring one and the other constructs, that is, people rely mostly on an appreciation of their current balance capabilities in answering question regarding their balance confidence, whereas they rely on an appreciation of their abilities to use a wide range of behaviors to avoid falling in responding to the falls efficacy scale (e.g., use a cane, pay more attention to hazards when walking, reduce walking pace). In sum, it appears that fear of falling, balance confidence, and falls efficacy are three related yet distinct constructs.

METHODS

Studies considered in this review were those reporting having examined one of the three falls-related psychological factors (i.e., fear of falling, balance confidence, and falls efficacy) either as primary or as secondary outcomes of preventive interventions. All preventive interventions offered to community-dwelling seniors were considered in this review, including exercise interventions, educational interventions, interventions combining strategies, and more specific interventions such as the use of hip protectors.

Search Methods

Relevant studies were identified primarily by searching electronic databases. Five databases were accessed in May 2007, including MEDLINE, CINAHL, PsycINFO, EMBASE, and Cochrane Central Register of Controlled Trials. Since literature on falls-related psychological factors emerged in the 1980s, a timeframe ranging from 1985 to 2007 was used to retrieve references. The search strategy involved combinations of key words referring to three domains: 1) falls-related psychological factors; 2) interventions; and 3) target population. Word truncation (using the $ symbol) was used when appropriate to optimize the search (e.g., the entry of "fall$" in the search window included the words fall, falls, and falling). Manual searches in the reference lists of relevant papers retrieved from the electronic databases or probing experts working in the falls prevention domain were also used as secondary search strategies.

Inclusion and Exclusion Criteria

References that were retrieved from electronic databases were screened initially through examination of title and/or abstracts. If relevant, the methods and results sections of the papers were also examined. Papers were included in the review if they met the following criteria: 1) reported results of a study examining the impact of a preventive intervention on one or more falls-related psychological factors either as primary or secondary outcomes; 2) randomization of participants or locations was a feature of the study's design; and 3) involved a sample of community-dwelling seniors aged at least 60 years. We excluded studies that were conducted among seniors recruited in hospitals and those conducted among seniors who had sustained a recent fracture or among seniors who presented medical conditions associated with important disabilities (e.g., stroke, Parkinson) or cognitive deficits. However, studies conducted among community-dwelling seniors that presented some risks of falls or falls-related injuries (e.g., seniors transitioning to frailty, or seniors presenting with osteopenia or osteoporosis) were included. Finally, searches were limited to the English and French languages.

Data Extraction

Data were independently extracted from relevant studies by two of the authors (JF and SL). Two other experts were consulted to resolve disagreements (LG and YR). The following data were extracted: 1) main intervention outcomes examined; 2) falls-related psychological factors purportedly examined; 3) measurement scales used to assess falls-related psychological factors; 4) overall sample and subgroup sample sizes; 5) criteria for selecting study participants; 6) general description of intervention and control or comparison conditions; 7) time interval (in weeks or months) until reassessment after baseline or entry into the study; and 8) summary of intervention effects on falls-related psychological outcomes. Because of frequent mismatches between purported constructs under investigation and measurement scales employed, studies were stratified according to the measurement scale.

Data extraction also included information regarding intervention strategy, content, and delivery process. To facilitate comparison between interventions, they were classified according to intervention strategies, namely: 1) exercise; 2) education; 3) combination of strategies; and 4) other strategies (e.g., use of hip protectors). The content of each intervention was qualitatively described (e.g., type of exercise, topics addressed). Information about frequency and duration of interventions and other dimensions such as inclusion of follow-up home visits/phone calls after the intervention period were also listed. Data regarding the delivery process included identification of the intervention setting (i.e., community, clinical, or home setting), the intervention approach (i.e., individualized, group), and the qualifications of the interventionists involved (i.e., health professional, Tai Chi or accredited exercise instructor).

RESULTS

From a total of eight hundred eighty-five (n=885) references retrieved through searches of electronic databases with the selected combinations of key words, only 24 met all selection criteria. Seven other papers were identified through our secondary search strategies. All papers retrieved were written in English.

Table 1 lists the main outcomes examined across the 31 studies, the purportedly investigated falls-related psychological constructs, and measurement scales used. As can be seen, ten of the 31 studies (32%) used fear of falling scales (mostly single question scales). Seven studies (23%) used balance confidence scales, and 18 studies (58%) used falls efficacy scales. Among the 31 studies reviewed, four studies (13%) examined the impact of interventions on more than one falls-related psychological constructs. As depicted in Table 1, there are frequent mismatches between the falls-related psychological outcomes that were purportedly investigated and the constructs that were measured. For example, in 10 studies, a falls self-efficacy or balance confidence scale was used although fear of falling was the construct purportedly investigated. Data in Table 1 also indicate that 20 studies (65%) included falls-related psychological factors as part of their main outcomes.

[Insert Table 1 here]

A detailed and stratified (A - Fear of falling, B - Balance confidence, or C - Falls efficacy) description of study features and findings is provided in Table 2.

Besides highlighting a variety of falls-related psychological outcomes measured in the studies, Table 2 also shows that studies varied extensively in terms of design and interventions investigated. Sample sizes ranged from 20 to 434 participants (mean=157; SD=110). Although all studies involved community-dwelling seniors, 6 studies (19%) included only women and 18 studies (58%) targeted seniors that presented an increased risk for falls (i.e., had a fall history, were afraid to fall, or presented a physical impairment or an osteopenic/osteoporotic condition).

Among a total of 41 interventions examined, 9 (22%) interventions were multifaceted (i.e. they combined strategies to achieve goals, mostly education and exercises), 24 (59%) interventions used exercise as a stand-alone strategy, 6 (15%) interventions used exclusively an educational strategy, and 2 (5%) interventions used very specific methods such as hip protectors and a mental imagery technique. There was also substantial variability in the duration and frequency of interventions (ranging from a few home visits within a 2-month period to exercising an hour three times per week for 1 year).

The nature of the exposures (or lack thereof) in the control or comparison group also varied largely. Some studies used true control groups, i.e. participants in these groups were exposed to one of the following conditions: 1) did not receive an intervention; or 2) received an attention control or social contact intervention. In some studies, researchers labeled the comparison group as a control group despite the fact that participants in these groups received an educational intervention on fall risks factors or were exposed to strategies to reduce risks.

Finally, some studies aimed at comparing the outcomes of two interventions and did not include a control group.

[Insert Table 2 here]

In terms of findings, 21 out of a total of 31 studies (68%) reported improvements in falls-related psychological outcomes. However, some studies reported only within group changes (i.e., compared pre-test and post-test scores in each group separately) without providing between group differences in change. As a result, the following synthesis of findings rests exclusively upon studies that actually compared changes across groups (n=28 studies). Furthermore, since a variety of intervention strategies were used across studies, we summarize findings according to intervention strategies: Table 3 synthesizes findings for multifaceted interventions; Table 4 synthesizes findings for interventions using exercise only; and Table 5 synthesizes findings for interventions using education only. Tables 3 to 5 also provide information about intervention content and delivery. Significant differences across groups in terms of changes in falls-related psychological outcomes are identified with a check mark (✓) whereas significant findings emerging only from within-group comparisons are labeled with a checkmark between brackets ([✓]).

[Insert Tables 3, 4, and 5 here]

Multifaceted Interventions

As depicted in Table 3, most multifaceted interventions combined exercise with educational component. Table 3 also shows that four interventions used a home-based individualized approach exclusively, four interventions used a community-based group approach exclusively, and one intervention combined both approaches. Four of the interventions were delivered by health professionals (occupational therapist, physical therapist, or nurse). One intervention was delivered by an accredited exercise instructor and another one was delivered by a public health worker. Three studies did not report the professional background of interventionists. Most multifaceted interventions included balance and strengthening exercises. Most educational components addressed a diversity of falls-related topics. The intervention investigated by Clemson and colleagues (the Stepping On program) appeared the most comprehensive (Clemson et al., 2004). Only two interventions specifically addressed falls-related psychological factors among its topics, namely the Stepping On program (Clemson et al., 2004) and the program investigated by Tennstedt and colleagues (1998). This latter intervention was specially designed to reduce fear of falling and fear-related activity restriction.

Regarding intervention impact, five out of six studies examining the impact on falls self-efficacy showed positive effects. These were: 1) a community-based educational program including a range of falls risks, an exercise component, and an individualized home-based safety improvement component (Clemson et al., 2004); 2) a home-based intervention combining education on fall risk factors, exercise, and home modifications (Gitlin et al., 2006); 3) a home-based intervention combining education on fall risk factors, exercise, home modifications, and consultation of participants' physician to review medication (Tinetti et al., 1994b); 4) a home-based intervention combining education on fall risk factors with exercise (Yates and Dunnagan, 2001); and 5) a community-based group cognitive-behavioral approach specially designed to reduce fear of falling and fear-related activity restriction that covered a range of fall risk factors and included an exercise component (Tennstedt et al., 1998). However, the latter had a significant impact only among more compliant participants. Among these five successful interventions, four included an individualized assessment.

None of the studies reported in Table 3 examined the impact of interventions on balance confidence. Only three studies examined the impact of interventions on fear of falling and none revealed a significant impact on this factor.

Exercise Interventions

Among the 41 interventions investigated in the reviewed studies, 24 (59%) used exercise as a stand-alone strategy (see Table 4). Among these interventions, 20 involved a balance component (including Tai Chi programs). This feature reflects the recognition in the literature that balance is an important intrinsic factor to address for the prevention of falls. Among the 24 exercise interventions, 9 were community-based, 5 were home-based, 6 were delivered in a clinical or research setting, and one intervention was delivered in two settings (clinical and home settings). The setting was not specified for 3 of the exercise interventions. A group approach was used in 15 interventions while 9 interventions used an individualized approach. Seven interventions were delivered by physical therapists, 7 were delivered by a Tai Chi instructor or accredited exercise instructor, 1 was delivered by a nurse, 1 was delivered by an interdisciplinary team. The professional background of interventionists was not reported for 9 of the interventions.

Regarding intervention impact, five out of eight studies that used falls efficacy scales showed a positive impact. Two studies showed a positive impact of community-based group Tai Chi programs when compared to a control group (Zhang et al., 2005) or an educational group intervention (Sattin et al., 2005). Two other studies showed a significant impact of individualized home-based exercise programs involving balance (Campbell et al., 1997; Robertson et al., 2001). One study found a significant impact of a conventional group exercise intervention (McCormack et al., 2004).

Four out of seven studies that used fear of falling scales showed positive outcomes of exercise interventions on fear of falling. Two of these showed that community-based group Tai Chi could reduce fear of falling (Li et al., 2005; Wolf et al., 1996). The other two studies demonstrated benefits of an individualized home-based exercise intervention involving balance (Delbaere et al., 2006; Lin et al., 2007).

Three out of six studies that used balance confidence scales revealed positive outcomes on balance confidence. Among these, two studies showed a positive impact of community-based group Tai Chi groups (Li et al., 2005; Sattin et al., 2005). One study found a positive impact of a community-based exercise program that simulated complex situations of everyday life on balance confidence (Weerdesteyn et al., 2006). Overall, community-based group Tai Chi and individualized home-based exercise programs involving balance appear to have a positive impact on falls-related psychological factors among community-dwelling seniors.

Educational Interventions

Six studies examined the impact of interventions that used education as a stand-alone strategy (see Table 5). Two of the interventions were delivered in a community-setting, three interventions were home-based, and one was delivered in an academic setting. Three interventions were delivered by nurses and one was delivered by a physical therapist. Two studies did not report the professional background of the interventionists. Most educational interventions addressed several fall risk factors.

Regarding interventions impact, only two of the six studies showed a positive impact on falls-related psychological factors (i.e., falls efficacy). Both interventions were home-based and included a personalized assessment followed by education on fall risk factors (Huang and Acton, 2004; van Haastregt et al., 2000). One of these interventions specifically addressed fear of falling.

Other Interventions

Two of the 31 reviewed studies examined the impact of more specific interventions on falls-related psychological outcomes. One study showed that the use of hip protectors combined with a follow-up by a nurse improved falls efficacy but did not change fear of falling (Cameron et al., 2000). The other study examined the impact of mental imagery training on balance confidence (see details in Table 2) and did not reveal any significant impacts of the intervention (Hamel and Lajoie, 2005).

DISCUSSION

The objectives of this review were to establish the impact of preventive interventions offered to community-dwelling seniors on fear of falling, falls efficacy, and balance confidence and to describe intervention features as a function of strategies, content, and delivery processes. Thirty-one studies reporting intervention impacts on falls-related psychological outcomes among community-dwelling seniors were identified.

Synthesis of findings highlights the wide range of interventions examined across studies. These include exercise interventions, educational interventions, interventions using a combination of strategies, as well as more specific interventions. There was also a great deal of variability in the intervention delivery process and content. This review also revealed the heterogeneity of methods used across investigations in terms of recruited populations, constructs investigated, measurement scales, timeframe for reassessment, and control group conditions.

Despite these numerous sources of variability, there is evidence of a positive impact of selected interventions on falls-related psychological factors. That is, synthesis of findings supports that community-based Tai Chi programs delivered in groups can reduce fear of falling, improve balance confidence, and falls self-efficacy (Wolf et al., 1996; Li et al., 2005; Sattin et al., 2005; Zhang et al., 2005). In addition, the review suggests that falls self-efficacy can be improved with multifaceted home-based interventions that combine exercise and educational strategies to reduce falls risks (Tinetti et al., 1994b; Yates et al., 2001; Gitlin et al., 2006). There is also evidence that home-based exercise interventions including a balance component can have a positive impact on fear of falling and falls efficacy (Campbell et al., 1997; Robertson et al., 2001; Delbaere et al., 2006; Lin et al., 2007). However, more studies are needed to draw conclusions regarding the psychological impact of community-based group interventions that include balance exercises, other than Tai Chi.

Overall, findings regarding the types of preventive interventions that may have a positive impact on psychological outcomes are consistent with those of a previous review (Zijlstra et al., 2007b). However, the present review complements the existing review in that it stratified findings according to each falls-related psychological construct. The fact that there is a great deal of mismatch between the measured constructs and those that researchers purportedly study, indicates as pointed out by Jørstadt and colleagues (2005), that there is still "confusion about the meaning of these falls-related psychological constructs and how they can be measured accurately". These factors are related but yet not isomorphic and therefore, may have different determinants and be responsive to different types of intervention (Li et al., 2002; Jørstadt et al., 2005).

Directions for Future Research

Even though the outcomes of 31 studies were examined in this paper, more research is needed to provide a clearer picture regarding the impact of interventions on each falls-related psychological factors. The heterogeneity of interventions offered to community-dwelling seniors in terms of strategies, content, and delivery process renders this need for research even more important. This review also underscores the need for more rigorous methods in future studies. First, researchers must be attentive to the choice of an assessment method in order to properly operationalize the specific construct of interest. Secondly, careful attention should be paid to the research design (cf.: use of true control conditions). Indeed, some of the reviewed studies used an educational falls prevention intervention as a control condition. Education cannot be considered a "neutral" intervention. Indeed, it can modify seniors' attitudes towards falls and may lead to changes in behaviors (e.g., increased involvement in physical activity). Thirdly, researchers should choose statistical procedures that account for differences across groups in terms of change rather than analyzing change only within groups. Finally, extensive details about interventions should be provided when reporting results of intervention studies.

Implications for Prevention

This review provides a useful guide for public health practitioners and policy-makers working toward falls prevention and health promotion among community-dwelling seniors. More specifically, this review suggests that interventions such as community-based Tai Chi delivered in groups, individualized home-based exercises, and multifaceted home-based interventions combining educational strategies to reduce fall risk factors with exercise can have a positive impact on falls-related psychological factors.

Since fear of falling, balance confidence, and falls efficacy can influence the health and quality of life of community-dwelling seniors, this review supports the relevance of considering these factors as important targets for public health interventions in conjunction with other important physical outcomes. It was somewhat surprising to note that among the 14 interventions that included an educational component, only 4 interventions specifically addressed the topic of fear of falling (Brouwer et al., 2003; Clemson et al., 2004; Tennstedt et al., 1998; van Haastregt et al., 2000). As falls-related psychological factors are recognized as important determinants of seniors' health and quality of life, future versions of existing interventions or new interventions should address this issue.

Strengths and Limitations

In line with the argument of several authors that fear of falling, balance confidence and falls efficacy are related but not isomorphic constructs (McAuley et al., 1997; Li et al., 2002; Jørstad et al., 2005), this review of intervention studies was conducted by stratifying findings according to specific falls-related constructs. The systematic search strategies and the use of two researchers for data extraction from the reviewed papers are other strengths of this review. Furthermore, in addition to summarizing intervention impacts on each falls-related construct, this review also provided a decomposition of each intervention into specific features (i.e., strategies, content, and delivery process). On the downside, one limitation of this review is the fact that the influence of methodological characteristics other than randomization was not addressed.

CONCLUSION

Recent research suggests that falls-related psychological factors such as fear of falling, balance confidence, and falls efficacy are important factors to target in prevention interventions offered to community-dwelling seniors as they can impact on seniors' health and quality of life. Thus, studies on the impact of interventions on these factors are important as they can provide guidance to public health about intervention strategies that can achieve optimal impacts on seniors' health and quality of life (Lach, 2002). This systematic review indicates that falls-related psychological factors are amenable to change among community-dwelling seniors. More specifically, it suggests that preventive interventions such as community-based Tai Chi delivered in groups, individualized home-based exercises, and multifaceted home-based interventions combining educational strategies to reduce fall risk factors with exercise can have a positive impact on falls-related psychological factors. However, more studies are needed to draw conclusions regarding the psychological impact of community-based group interventions that include balance exercises, other than Tai Chi. Overall, more tightly designed research is warranted on the impact of preventive interventions offered to community-dwelling seniors on each specific falls-related psychological construct.

ACKNOWLEDGMENTS

The first author would like to acknowledge the financial support of the Fonds de la recherche en santé du Québec, the Ordre des ergothérapeutes du Québec, and the Faculté des études supérieures de l'Université de Montréal for awarding her with doctoral fellowships. As part of a larger investigation on the impact of a community-based falls prevention program on several outcomes, this review was also partially supported by the Canadian Institutes of Health Research (Grant No. MOP 53123). The authors also wish to thank Denise D'Anjou from the School of Rehabilitation of the Université de Montréal for her technical support during the preparation of this manuscript.

REFERENCES

Arai, T., Obuchi, S., Inaba, Y., et al., 2007. The effects of short-term exercise intervention on falls self-efficacy and the relationship between changes in physical function and falls self-efficacy in Japanese older people. A randomized controlled trial. Am. J. Phys. Med. Rehabil. 86, 133-141.

Bandura, A., 1977. Self-efficacy: Toward a unifying theory of behavioural change. Psychol. Rev. 84, 191-215.

Barnett, A., Smith, B., Lord, S.R., et al., 2003. Community-based group exercise improves balance and reduces falls in at-risk older people: A randomised controlled trial. Age Ageing 32, 407-414.

Brouwer, B.J., Walker, C., Rydahl, S.J., Culham, E.G., 2003. Reducing fear of falling in seniors through education and activity programs: A randomized trial. J. Am. Geriatr. Soc. 51, 829-834.

Cameron, I.D., Stafford, B., Cumming, R.G., et al., 2000. Hip protectors improve falls self-efficacy. Age Ageing 29, 57-62.

Campbell, A.J., Robertson, M.C., Gardner, M.M., et al., 1997. Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women. BMJ 315, 1065-1069.

Clemson, L., Cumming, R.C., Kendig, H., et al., 2004. The effectiveness of a community-based program for reducing the incidence of falls in the elderly: A randomized trial. J. Am. Geriatr. Soc. 52, 1487-1494.

Close, J.C.T., 2005. Prevention of falls – a time to translate evidence into practice. Age Ageing 34, 98-100.

Cumming, R.G., Salkeld, G., Thomas, M., Szonyi, G., 2000. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. J Gerontol Med Sci 55, 299-305.

Delbaere, K., Crombez, G., Vanderstraeten, G., et al., 2004. Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. Age Ageing 26, 1-6.

Delbaere, K., Bourgois, J., van den Noortgate, N., et al., 2006. A home-based multidimensional exercise program reduced physical impairment and fear of falling. Acta Clinica Belgica 61, 340-350.

Devereux, K., Robertson, D., Briffa, N.K., 2005. Effects of a water-based program on women 65 years and over: A randomised controlled trial. Austral. J. Physiother. 51, 102-108.

Filiatrault, J., Gauvin, L., Fournier, M., et al., 2007. Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors. Arch. Phys. Med. Rehabil. 88, 664-872.

Friedman, S.M., Munoz, B., West, S.K., et al., 2002. Falls and fear of falling: Which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. J. Am. Geriatr. Soc. 50, 1329-1335.

Gallagher, E.M., Howard, B., 1996. Head over heels: Impact of a health promotion program to reduce falls in the elderly. Can. J. Aging. 15, 84-96.

Gitlin, L.N., Winter, L., Dennis, M.P., et al., 2006. A randomized trial of a multicomponent home intervention to reduce functional difficulties in older adults. J. Am. Geriatr. Soc. 54, 809-816.

Hamel, M.F., Lajoie, Y., 2005. Mental imagery. Effects on static balance and attentional demands of the elderly. Aging Clin. Exp. Res. 17, 223-228.

Herbert, R.D., Bø, K., 2005. Analysis of quality of interventions in systematic reviews. BMJ 331, 507-509.

Hinman, M.R., 2002. Comparison of two short-term balance training programs for community-dwelling older adults. J. Geriatr. Phys. Ther. 25, 10-15.

Huang, T.-T., Acton, G.J., 2004. Effectiveness of home visit falls prevention strategy for Taiwanese community-dwelling elders: randomized trial. Public Health Nursing 21, 247-256.

Jørstad, E.C., Hauer, K., Becker, C., Lamb, S.E., 2005. Measuring the psychological outcomes of falling: A systematic review. J. Am. Geriatr. Soc. 53, 501-510.

Lach, H.W., 2002. Fear of falling: An emerging public health problem. Generations J. Am. Soc. Aging 26, 33-37.

Lachman, M.E., Howland, J., Tennstedt, S., et al., 1998. Fear of falling and activity restriction: The Survey of Activities and Fear of Falling in the Elderly (SAFE). J. Gerontol. Psychol. Sci. 53, 43-50.

Li, F., McAuley, E., Fisher, K.J., et al., 2002. Self-efficacy as a mediator between fear of falling and functional ability in the elderly. J. Aging Health 14, 452-466.Li, F., Fisher, K.J., Harmer, P., McAuley, E., & Wilson, N.L., 2003. Fear of falling in elderly persons: Association with falls, functional ability, and quality of life. J. Gerontol. Psychol. Sci. 58, 283-290.

Li, F., Harmer, P, Fisher, K.J., et al., 2005. Tai Chi and falls reductions in older adults: a randomized controlled trial. J. Gerontol. Med. Sci. 60, 187-194.

Lin, M.-R., Wolf, S.L., Hwang, H.-F., Gong, S.-Y., 2007. A randomized controlled trial of fall prevention programs and quality of life in older fallers. J. Am. Geriatr. Soc. 55, 499-506.

Liu-Ambrose, T., Khan, K.M., Eng, J.J., et al., 2004. Balance confidence improves with resistance or agility training. Gerontol. 50, 373-382.

Marks, R., Allegrante, J.P., 2004. Falls-prevention programs for older ambulatory community-dwellers: From public health research to health promotion policy. Präventivmed 49, 171-178.

McAuley, E., Mihalko, S.L., Rosenberg, K., 1997. Self-efficacy and balance correlated of fear of falling in the elderly. J. Aging Phys. Act. 5, 329-340.

McCormack, G., Lewin, G., McCormack, B., et al., 2004. A pilot study for comparing the influence of different types of exercise intervention on the fear of falling in older adults. Australas. J. Ageing 23, 131-135.

Mendes de Leon, C.F., Seeman, T.E., Baker, D.I., et al., 1996. Self-efficacy, physical decline, and change in functioning in community-living dwellers: A prospective study. J. Gerontol. Soc. Sci. 51, 183-190.

Myers, A.M., Fletcher, P.C., Myers, A.H., Sherk, W., 1998. Discriminative and evaluative properties of the Activities-specific Balance Confidence (ABC) Scale. J. Gerontol. Med. Sci. 53, 287-294.

Nitz, J.C., Low Choy, N., 2004. The efficacy of a specific balance-strategy training programme for preventing falls among older people: a pilot randomised controlled trial. Age Ageing 33, 52-58.

Parry, S.W., Steen, N., Galloway, S.R., Kenny, R.A., Bond, J., 2001. Falls and confidence related quality of life outcome measures in an older British cohort. Postgrad. Med. J. 77, 103-108.

Powell, L.E., Myers, A.M., 1995. The Activities-specific Balance Confidence (ABC) Scale. J. Gerontol. Med. Sci. 50, 28-34.

Reinsch, S., MacRae, P., Lachenbruch, P.A., Tobis, J.S., 1992. Attempts to prevent falls and injury: A prospective community study. The Gerontologist 32, 450-456.

Richard, L., Gauvin, L., Gosselin, C., et al., In Press. Integrating the ecological approach in health promotion for older adults: a survey of programmes aimed at elder abuse prevention, falls prevention, and appropriate medication use. Int. J. Public Health.

Robertson, M.C., Devlin, N., Gardner, M.M., et al., 2001. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. BMJ 322, 697-701.

Rubenstein, L.Z., 2006. Falls in older people: Epidemiology, risk factors and strategies for prevention. Age Ageing 35, ii37-ii41.

Sattin, R.W., Easley, K.A., Wolf, S.L., et al., 2005. Reduction in fear of falling through intense Tai Chi exercise training in older, transitionally frail adults. J. Am. Geriatr. Soc. 53, 1168-1178.

Sihvonen, S.E., Sipilä, S., Era, P.A., 2004. Changes in postural balance in frail elderly women during a 4-week visual feedback training: A randomized controlled trial. Gerontol. 50, 87-95.

Simpson, J.M., Jones, F., 2004. Physiological or psychological change? Which is the most important rehabilitation outcome for older people who fall? Age Ageing 33, 204-211.

Tennstedt, S., Howland, J., Lachman, M., Peterson, E., Kasten, L., Jette, A., 1998. A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. J. Gerontol. Psychol. Sci. 53, 384-392.

Tinetti, M.E., Richman, D., Powell, L., 1990. Falls Efficacy as a measure of fear of falling. J. Gerontol. Psychol. Sci. 45, 239-243.

Tinetti, M.E., Mendes de Leon, C.F., Doucette, J.T., Baker, D.I., 1994a. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. J. Gerontol. Med. Sci. 49, 140–147.

Tinetti, M.E., Baker, D.I., McAvay, G., et al., 1994b. A multifactorial intervention to reduce the risk of falling among elderly people living in the community. N. Engl. J. Med. 331, 821-827.

van Haastregt, J.C.M., Diederiks, J.P.M., van Rossum, E., et al., 2000. Effects of a programme of multifactorial home visits on falls and mobility impairments in elderly people at risk: Randomised controlled trial. BMJ 321, 994-998.

van Heuvelen MJ, Horchstenbach J, de Greef J, et al., 2005. Is the Activities-specific Balance Confidence Scale suitable for Dutch older persons living in the community? [Article in Dutch] Tijdschrift voor Gerontologie en Geriatrie 36,146-154.

Wallsten, S.M., Bintrim, K., Denman, D.W., et al., 2006. The effect of Tai Chi Chuan on confidence and lower extremity strength and balance in residents living independently at a continuing care retirement community. J. Appl. Gerontol. 25, 82-95.

Weerdesteyn, V., Rijken, H., Geurts, A.C., et al., 2006. A five-week exercise program can reduce falls and improve obstacle avoidance in the elderly. Gerontol. 52, 131-141.

Wilson, M.-M.G., Miller, D.K., Andresen, E.M., et al., 2005. Fear of falling and related activity restriction among middle-aged African Americans. J. Gerontol. Med. Sci. 60, 355-360.

Wolf, S.L., Barnhart, H.X., Kutner, N.G., McNeely, E., Coogler, C., Xu, T., the Atlanta FICSIT Group, 1996. Reducing frailty and falls in older persons: An investigation of Tai Chi and computerize balance training. J. Am. Geriatr. Soc. 44, 489-497.

Wolf, B., Feys, H., De Weerdt, W., et al., 2001. Effect of a physical therapeutic intervention for balance problems in the elderly: a single-blind, randomized, controlled multicentre trials. Clin. Rehabil. 15, 624-636.

Yardley, L., Smith, H., 2002. A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. The Gerontologist 42, 17-23.

Yardley, L., 2004. Fear of falling: links between imbalance and anxiety. Rev. Clin. Gerontol. 13, 195-201.

Yates, S.M., Dunnagan, T.A., 2001. Evaluating the effectiveness of a home-based fall risk reduction program for rural community-dwelling older adults. J. Gerontol. Med. Sci. 56, 226-230.

Zhang, J.-G., Ischikawa-Takata, K., Yamazaki, H., et al., 2005. The effects of Tai Chi Chuan on psychological function and fear of falling in the less robust elderly: An intervention study for preventing falls. Arch. Gerontol. Geriatr. 42, 107-116.

Zijlstra, G.A.R., Tennstedt, S.L., van Haastregt, J.C.M., et al., 2007a. Reducing fear of falling and avoidance of activity in elderly persons: The development of a Dutch version of an American intervention. Patient Educ. Counsel. 62, 220-227.

Zijlstra, G.A.R., van Haastregt, J.C.M., van Rossum, E., et al., 2007b. Interventions to reduce fear of falling in community-living older people: A systematic review. J. Am. Geriatr. Soc. 55, 603-615.

Table 1. Main Outcomes, Purportedly Investigated Psychological Constructs, and Measurement Scales Used in Intervention Studies

Study	Main Outcomes	Purportedly Investigated Falls-Related Psychological Constructs	Measurement Scales (corresponding constructs)
1. Arai et al. (2007)	Physical function, falls efficacy	Falls efficacy	FES (falls efficacy)
2. Barnett et al. (2003)	Physical functioning, health status, falls	Fear of falling	A single question; response scale unspecified (fear of falling)
3. Brouwer et al. (2003)	Fear of falling, balance, strength, health status	Fear of falling	ABC Scale (Balance Confidence)
4. Cameron et al. (2000)	Fear of falling, falls efficacy	Fear of falling	A single question with yes/no answers (fear of falling)
		Falls efficacy	FES and MFES (falls efficacy)
5. Campbell et al. (1997)	Falls	Fear of falling	FES, with inverted response scale (falls efficacy)
6. Clemson et al. (2004)	Falls, falls efficacy	Falls efficacy	MFES and MES (falls efficacy)
7. Delbaere et al. (2006)	Muscle strength, balance, aerobic performance	Fear of falling	A single question and a Dutch version of the SAFFE (fear of falling)
8. Devereux et al. (2005)	Balance, fear of falling, quality of life	Fear of falling	MFES (falls efficacy)
9. Gallagher & Brunt (1996)	Falls, fear of falling, falls efficacy, health service use, quality of life, social activities of daily living	Fear of falling	Scale developed for the FICSIT project (fear of falling)
		Falls efficacy	Measure developed for the Ottawa-Carleton Health Department study of falls in the elderly (falls efficacy)
10. Gitlin et al. (2006)	Functional difficulties, functional efficacy, fear of falling	Fear of falling	FES with 3 additional items from the ABC Scale (falls efficacy)
11. Hamel et al. (2005)	Postural oscillations, attentional demands	Confidence regarding risks of falling	ABC Scale (balance confidence)
12. Hinman et al. (2002)	Balance performance, gait speed, reaction time, falls efficacy, perceived benefits	Falls efficacy	MFES (falls efficacy)
13. Huang et Acton (2004)	Falls, falls efficacy, environmental risks, and knowledge of medication safety	Falls efficacy	FES (falls efficacy)
14. Li et al. (2005)	Falls	Fear of falling	SAFFE (fear of falling)
		Falls efficacy	ABC Scale (balance confidence)
15. Lin et al. (2007)	Quality of life	Fear of falling	10-cm visual analog scale (fear of falling)
16. Liu-Ambrose et al. (2004)	Fall risk, posture stability, gait speed, general physical function, balance confidence	Balance confidence	ABC Scale (balance confidence)
17. McCormack et al. (2004)	Falls efficacy	Falls efficacy	MFES (falls efficacy)

Table 1. Main Outcomes, Purportedly Investigated Psychological Constructs, and Measurement Scales Used in Intervention Studies (continued)

Study	Main Outcomes	Purportedly Investigated Falls-Related Psychological Constructs	Measurement Scales (corresponding constructs)
18. Nitz & Low Choy (2004)	Falls, functional ability, balance ability, fear of falling	Fear of falling	FES (falls efficacy)
19. Reinsch et al. (1992)	Falls and fall-related injuries	Fear of falling	A single question with a 5-category rating scale from 1 = not at all worried to 5 = extremely worried (fear of falling)
20. Robertson et al. (2001)	Falls, fall-related injuries, costs of implementing the program, and hospital costs as a result of falls	Fear of falling	FES, with inverted response scale (falls efficacy)
21. Sattin et al. (2005)	Fear of falling	Fear of falling	FES (falls efficacy) Balance confidence (ABC Scale)
22. Sihvonen et al. (2004)	Falls	Fear of falling	A single question with a 3-category response scale; 1 = no; 2 = yes, some; 3 = yes, a lot (fear of falling)
23. Tennstedt et al. (1998)	Fear of falling, physical, social, and functional activities	Fear of falling	FES + 2 additional items (falls efficacy)
24. Tinetti et al. (1994b)	Falls	Falls efficacy	FES, inverted response scale (falls efficacy)
25. van Haastregt et al. (2000)	Falls Impairments in mobility	Fear of falling	FES (falls efficacy)
26. Wallsten et al. (2006)	Lower extremity strength and balance confidence in performing daily activities	Confidence in performing daily activities	ABC Scale (balance confidence)
27. Weerdesteyn et al. (2006)	Falls, balance, balance confidence, obstacle performance avoidance	Balance confidence	Dutch version of the ABC;7 items were removed to avoid ceiling effects (balance confidence)
28. Wolf et al. (1996)	Biomedical, functional and psychosocial indicators of frailty, including fear of falling	Fear of falling	A single question with a 4-category rating scale (fear of falling)
29. Wolf et al. (2001)	Balance functioning, fear of falling, feelings of anxiety and depression	Fear of falling	100-mm visual analog scale (fear of falling)
30. Yates & Dunnagan (2001)	Balance, bicep endurance, lower extremity power, environmental hazards, falls efficacy, nutritious food behaviour.	Confidence in performing ADL	FES (falls efficacy)
31. Zhang et al. (2005)	Physiological function Fear of falling	Fear of falling	Chinese version of the FES (falls efficacy)

Abbreviations: FES = Falls Efficacy Scale; ABC Scale = Activities-specific Balance Confidence Scale; MFES = Modified FES (i.e., FES + 4 additional items); MES = Mobility Efficacy Scale; SAFFE = Survey of Activities and Fear of Falling in the Elderly.

Table 2. Detailed Description of Intervention Study Features and Findings

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
A - Studies Using Fear of Falling Scales as Outcome Measures: (n = 10)				
Barnett et al. (2003)				
n = 163 (IG: n = 83; CG: n = 80)	Aged ≥ 65 years 1 or more physical impairments that could be addressed by exercise participation	IG: 1-year supervised group exercise program (an hour per week) with ancillary home exercises and a brochure on strategies to avoid falls. CG: Participants only received the brochure including fall prevention information.	6 months	No significant difference between groups in terms of change.
Cameron et al. (2000)				
n = 131 (IG: n = 61; CG: n = 70)	Women living at home Aged ≥ 75 years ≥ 2 falls or 1 fall requiring hospitalization in the previous year	IG: Participants were provided with external hip protectors and encouraged to wear them for 2 years. A nurse made 3 face-to-face contacts in the first 4 months. Additional contacts or visits were arranged for participants who were not compliant. CG: Participants did not receive any intervention.	4 months	No significant difference between groups in terms of change.
Delbaere et al. (2006)				
n = 66 (IG: n = 38; CG: n = 28)	Aged ≥ 70 years Independent-living status ≥ 2 falls or 1 osteoporotic fracture as a result of a fall Moderate physical impairment Not involved in another exercise program	IG: 24 home-based individualized exercise sessions of 30 minutes provided by a physiotherapist over a 16-week period. Participants were instructed to exercise on their own initiative between sessions with physiotherapist. Detailed booklet, 1 lb adjustable ankle and wrist weights, a hand squeeze and individual exercise-referral schemes were also provided. CG: 1-hr educational session on falls and a booklet including general information on falls prevention. Participants were asked to continue their normal activities.	16 weeks	Significant difference between groups: The IG showed a reduction in fear of falling whereas the CG showed an increase.
Gallagher & Brunt (1996)				
n = 100 (IG : n = 50; CG : n = 50)	Aged ≥ 60 years Experienced a fall in the previous 3 months	IG: Comprehensive risk assessment and individualized feedback about identified risks (2 home visits of 45 min for assessment and 1 home visit of 60 min for counselling and showing a video and a booklet on falls prevention; the 3 home visits were done over a two-week period). CG: Participants did not receive any intervention.	6 months	No significant difference between groups in terms of change.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Li et al. (2005)				
n = 256 (IG: n = 125; CG: n = 131)	Aged ≥ 70 years Ambulatory Inactive	IG: 1-hr Tai Chi sessions, 3 times per week for 6 months. CG: 1-hr stretching exercise sessions, 3 times per week for 6 months.	6 and 12 months	Significant difference between groups: Larger reduction in fear of falling in the IG than the CG noted at post-test and at follow-up.
Lin et al. (2007)				
n = 150 (IG1: n = 50; IG2: n = 50; CG: n = 50)	Aged ≥ 65 years Required medical attention due to a fall in the previous 4 weeks	IG1: Home-based individualized exercise training (one 40- to 60-min training session per 2 weeks, during 4 months). IG2: Home safety assessment and recommendations for home modification (one 30- to 40-min visit per 2 weeks for 4 months). Fourteen inexpensive modifications were completed within the first week. CG: 30- to 40-min social visits per 2 weeks for 4 months. Pamphlets were given and provided information on falls prevention.	6 and 8 months	The IG1 group had a significant reduction in fear of falling compared to the educational control group. The IG2 did not change.
Reinsch et al. (1992)				
n = 230 (IG1: n = 57; IG2: n = 51; IG3: n = 72; CG: n = 50)	Aged > 60 years	IG1: Low-intensity group exercise program to improve strength and balance (three 1-hour sessions per week for 1 year). IG2: Cognitive-behavioural group intervention including a health and safety curriculum to prevent falls, relaxation training to lower tension and fear, and videogame playing to improve reaction time (one 1-hour session per week for 1 year). IG3: Combination of intervention #1 (1-hr sessions, twice per week for 1 year) and intervention #2 (one 1-hour session per week for 1 year); relaxation training and discussion on safety topics were added to exercises sessions. CG: Discussion on health and topics not related to falls prevention (1-hr session, once per week for 1 year).	12 months	No significant difference between groups in terms of change. No significant change in any group.
Sihvonen et al. (2004)				
n = 28 (IG: n = 20; CG: n = 8)	Women Aged ≥ 70 years Ability to stand without a walking aid	IG: Individualized visual feedback-based balance training (20 to 30-min session, 3 times per week for 4 weeks). CG: Participants did not receive any intervention and were told to continue their normal daily routines.	4 weeks and 12 months	Significant decrease in fear of falling in the IG at 4 weeks. This positive effect was no longer present at 12 months. No change in the CG.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Wolf et al. (1996)				
n = 200 (IG1: n = 72; IG2: n = 64; IG3: n = 64)	Aged ≥ 70 years Ambulatory	IG1: Tai Chi sessions (45-min sessions, twice a week, for 15 weeks). Participants were also encouraged to practice exercises at home at least 15 min. twice a day. IG2: Computerized balance training sessions (45-min session, once per week for 15 weeks) CG: Educational sessions to discuss topics of interest for older people other than fall prevention (one 60-min session each week for 15 weeks). Participants were instructed not to change their exercise levels throughout the study.	15 weeks 4 months post-intervention	Significant difference in terms of change in fear of falling from pre to post-intervention for IG1 compared to CG. An increase in the proportion of participants with no fear of falling was observed in the IG1, whereas this proportion decreased in the CG. No significant difference in terms of change was observed at the 4-month follow-up across intervention groups.
Wolf et al. (2001)				
n = 94 (IG: n = 47; CG: n = 47)	Aged ≥ 75 years Impaired balance Living independently or in a residential care facility	IG: Clinical examination plus an individualized balance training programme (twelve 30-min sessions held 2 or 3 times a week during 4 to 6 weeks). CG: Individual-oriented activities based on the participants own abilities, interests, and preferences (frequency and duration of the sessions were similar to those of IG1).	4-6 weeks 8-10 weeks	No significant difference between groups in terms of change.
B - Studies Using Balance Confidence Scales as Outcome Measures: (n = 7)				
Brouwer et al. (2003)				
n = 38 (IG1: n = 19; IG2: n = 19)	Aged between 67 and 87 years Living independently Fear of falling and activity restriction	IG1: Group exercise program (1-hr session each week for 8 weeks) including low-resistance exercises, reaching, weight-shifting, marching and stepping. Participants were encouraged to follow a 40-min home exercise program twice a week (program described and illustrated in a booklet). IG2: Group educational program (1-hr session each week for 8 weeks) engaging participants in discussions about their concerns regarding falling and on topics pertaining to identifying and reducing risk factors for falls (a manual was provided to each participant including documentation and resources).	8 weeks (post-test) and 6 weeks later	Both groups had a significant improvement in balance confidence from initial assessment to reassessment. However, there was no significant difference between groups in terms of change in balance confidence.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Hamel et al. (2005)				
n = 20 (IG : n = 12; CG : n = 8)	Aged between 65 and 90 years Berg Balance score of ≥ 45 ABC score of ≥ 66% No history of falls No use of physical aids for walking Right handed	IG: Group mental imagery training consisting of relaxation followed by mental imagery (imagining maintaining a perfectly straight and stable standing position while paying attention to physical sensations accompanying the mental images of this position). Weekly group sessions, for 6 consecutive weeks. Participants were also encouraged to practice mentally once a day at home. CG: Participants did not undergo any training during the 6-week period.	6 weeks (post-test)	No significant difference between groups in terms of change. Both groups remained stable.
Li et al. (2005)				
See fear of falling section	See fear of falling	See fear of falling section	6 months	Significant difference between groups in terms of change: Greater improvement of ABC scores in the IG than CG at post-test.
Liu-Ambrose et al. (2004)				
n = 104 (IG1:n = 34; IG2: n = 36; IG3: n = 34)	Women Aged between 75 and 85 years Diagnosis of osteopenia or osteoporosis Not exercising regularly	IG1: Resistance training sessions to increase muscle strength (50-min sessions, twice a week, for a maximum of 48 sessions). IG2: Agility training sessions to challenge coordination, balance and reaction time (50-min sessions, twice a week, for a maximum of 48 sessions). Hip protectors were provided. CG: General stretching sessions (50-min sessions, twice a week, for a maximum of 48 sessions).	13 weeks	Significant improvement of balance confidence in resistance training and agility training. No change in balance confidence in the stretching control group.
Sattin et al. (2005)				
n = 311 (IG: n = 158; CG: n = 153)	Women Aged ≥ 70 years Ambulatory One or more falls in the previous year Transitioning to frailty	IG1: Tai Chi sessions (two sessions per week, for 48 weeks; session were of increasing duration, starting at 60 minutes contact time and progressing to 90 min. contact time) IG2: Wellness education sessions (1-hr session, once per week, for 48 weeks) including instruction about falls prevention, exercise and balance, diet and nutrition, pharmacological management, legal issues relevant to health, changes in body function, mental health issues such as stress, depression and life changes. Interactive handout material was also provided.	Every 4 months for 1 year	Significant difference between groups: Mean ABC score increased with each follow-up in IG1. In the IG2, the mean ABC score increased at the first follow-up and then decreased with final measure being lower than baseline measure. After adjusting for covariates, the mean ABC score was significantly greater in IG1 than in the IG2 at the 12-month follow-up.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Wallsten et al. (2006)				
n = 77 (Early IG: n = 41; Late IG: n = 36)	Living independently	Early IG: 1-hre Tai Chi sessions, twice a week, for 20 weeks. No intervention for the following 20 weeks. Late IG: No intervention for 20 weeks, followed by 1-hre Tai Chi sessions, twice a week, for the following 20 weeks.	10, 20 and 40 weeks	No significant difference between groups in terms of change.
Weerdesteyn et al. (2006)				
n = 107 (IG1: n = 30; IG1-NR*: n = 49; CG: n = 28) * IG1-NR : participants that took part of a non randomized group	Aged ≥ 65 years 1 or more falls in the previous year Able to walk 15 min without the use of a walking aid	IG: Exercise program (1.5-hre sessions, twice a week, for 5 weeks). The program included balance, gait, and coordination training in an obstacle course and functional tasks (reaching, standing up, and position change). The program included performing balance and gait tasks simultaneously with various additional motor and cognitive tasks and under visual constraints. The program also included walking exercises that simulated walking in crowded environment with many changes in speed and direction, and practice of fall techniques. CG: Participants did not receive any specific training.	4 to 9 weeks	Significant difference between pooled exercise groups and control group in terms of change. Mean balance confidence score increased in the pooled exercise groups and decreased in the control group.
C - Studies Using Falls Efficacy Scales as Outcome Measures: (n = 18)				
Arai et al. (2007)				
n = 171 (IG: n = 86; CG: n = 85)	Aged ≥ 65 years Ambulatory	IG: Progressive resistance and balance sessions conducted by an interdisciplinary team (1.5-hr session, twice a week, for 3 months). CG: Health education sessions (1.5-hr sessions, twice a month for 3 months). Content of lectures were intended to help people age successfully (one topic was on falls prevention for seniors)	3 months	No improvement of FES scores in either group.
Cameron et al. (2000)				
See fear of falling section	See fear of falling section	See fear of falling section	4 months	Significant difference between groups: Greater mean improvement in FES and MFES scores in users of hip protectors.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Campbell et al. (1997)				
n = 233 (IG: n = 116; CG: n = 117)	Women Aged ≥ 80 years Ambulatory Not receiving physiotherapy	IG: Individually tailored home exercise program (4 home visits of 1 hour by a physical therapist in the first 2 months and motivation phone calls during the 1-year follow-up). Participants were instructed to practice a 30-min home exercises program at least 3 times a week and to walk outside at least 3 times a week. An instruction booklet was also provided. CG: 4 social visits at home by a nurse in the first 2 months and phone contacts during the 1-year follow-up.	12 months	Significant difference between groups: Falls efficacy scores decreased more in the control group.
Clemson et al. (2004)				
n = 310 (IG: n = 157; CG: n = 153)	Aged ≥ 70 years Fallen in the previous year or concerned about falling	IG: Community-based group educational sessions (2-hr sessions, once per week for 7 weeks) that included exercise. The intervention, called the Stepping On program, aimed at improving falls efficacy, encouraging behavioural change, and reducing falls. The intervention also included a follow-up home visit, and a booster session 3 months after the 7th session. CG: The control group received up to two social visits. Falls and falls prevention were not discussed during these visits.	14 months	No significant difference between groups in terms of change in the MFES scores. Significant difference between groups in terms of change in the MES scores: The mean change in MES was negative in the CG and positive in the IG.
Devereux et al. (2005)				
n = 50 (IG: n = 25; CG: n = 25)	Women Aged ≥ 65 years Diagnosis of osteopenia or osteoporosis	IG: Water-based exercise and self-management program (1-hr sessions, twice a week, for 10 weeks). Each session comprised warm-up, stretches, aerobic, Tai Chi, strength, posture, gait, vestibular, proprioception, and balance activities (50 min), and education (10 min) related to self-management topics such as osteoporosis, medications, footwear, physical activity, goal setting, home exercise programs, falls risks and hazards. CG: Participants did not receive any instructions and were not encouraged to change their physical activity, ADLs or social habits.	10 weeks	No significant difference between groups in terms of change.
Gallagher & Brunt (1996)				
See fear of falling section	See fear of falling section	See fear of falling section	6 months	No significant difference between groups in terms of change.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Gitlin et al. (2006)				
n = 319 (IG: n = 160; CG: n = 159)	Aged ≥ 70 years Reporting difficulty with 1 or more activities of daily living	IG: 4 home visits by an occupational therapist, plus a telephone contact and 1 home visit by a physical therapist on a 6-month period. The intervention consisted in training in the use of control-enhancing strategies including cognitive, behavioural and environmental modifications. It included four treatment components: 1) education and problem solving, 2) home modifications, 3) energy conserving techniques, 4) balance and muscle strengthening and teaching of falls-recovery techniques. The intervention included payment for and installation of home adaptations (e.g. grab bars, rails, raised toilet seat) and three telephone calls following the 6-month period of the intervention to reinforce the use and generalization of intervention-derived strategies. CG: Participants did not receive any intervention during the study period.	6 and 12 months	Significant difference between groups in terms of change in falls efficacy: At 6 months, the IG had an increase in falls efficacy whereas the CG had a decrease. Benefits were sustained in the IG at 12 months.
Hinman et al. (2002)				
n = 97 (IG1 : n = 34; IG2 : n = 32; CG : n = 31)	Aged between 63 and 87 years Ambulate independently	IG1: Individual computerized balance training (20-min session, 3 times a week for 4 weeks). IG2: Home exercise program including illustrated balance exercises and activities (20-min practice, 3 times a week for 4 weeks). CG: Participants were asked not to engage in any new exercise or training programs for the duration of the study.	4 weeks	No significant difference between groups in terms of change. A slight improvement in falls efficacy was noticed in both intervention groups whereas the control group had a slight decrease in falls efficacy.
Huang et Acton (2004)				
n = 120 (IG: n = 60; CG: n = 60)	Aged ≥ 65 years	IG: One home visit for assessment of individual fall-related risk factors and a second home visit 2 months after initial assessment to provide an educational intervention aiming to improve self-efficacy to prevent falls, knowledge of medication safety, and to decrease the number of environmental risks). The intervention participants also received a standardized fall prevention brochure. CG: Standardized fall prevention brochure.	4 months	Significant difference between groups in terms of change: Greater change in the IG than the CG.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
McCormack et al. (2004)				
n = 43 (IG1: n = 17; IG2: n = 18; CG: n = 8)	Aged ≥ 65 years Not exercising regularly or already belonging to a formal exercise session	IG1: Conventional low intensity exercise sessions (30- to 45-min sessions, twice per week, for 10 weeks). IG2: Holistic exercise sessions (30- to 45-min sessions, twice per week, for 10 weeks). The intervention uses the ROM dance method which includes movements based on the principles of Tai Chi. CG: Participants were asked to continue their normal daily activities and to refrain from joining any formal exercise sessions during the study.	10 weeks	Significant difference between IG1 and CG in terms of change: mean falls efficacy scores improved in the IG1 and decreased in the CG.
Nitz & Low Choy (2004)				
n = 73 (IG: n = 37; CG: n = 36)	Aged ≥ 60 years Living independently Had fallen in the previous year	IG1: Specific balance-strategy training program (workstation format) delivered in a clinical setting. The workstation included individual exercises and small group exercises (1-hr session per week for 10 weeks). Participants also received an education booklet on reducing the risk of a fall in the home and community. IG2: Traditional exercise sessions (40-min sessions, once a week for 10 weeks). Participants also received an education booklet on reducing the risk of a fall in the home and community.	10 weeks and 3 months later.	No significant change from pre-intervention to post-intervention in both groups.
Robertson et al. (2001)				
n = 240 (IG: n = 121; CG: n = 119)	Aged ≥ 75 years Ambulatory Not receiving physiotherapy	IG: Individually tailored home exercise program (5 home visits by a nurse in the first 2 months including a booster visit after 6 months, and motivation phone calls for 1 year). Participants were instructed to practice a 30-min home exercises program at least 3 times a week and to walk outside at least twice a week. CG: Usual care.	12 months	Significant difference between groups in terms of change.⁺
Sattin et al. (2005)				
See balance confidence section	See balance confidence section	See balance confidence section	Every 4 months for 1 year	Significant difference between groups. Mean FES became significantly lower (better) in the Tai Chi group at 8 and 12-month follow-ups.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Tennstedt et al. (1998)				
n = 434 (IG: n = 216; CG: n = 218)	Aged ≥ 60 years Self-reported restriction in activity due to fear of falling	IG: A group intervention, called *A Matter of Balance* program, designed to reduce fear of falling by increasing self-efficacy and the sense of control over falling (2-hre sessions, twice a week for 4 weeks). Activities included watching a video on fear of falling, lectures, group discussion, mutual problem solving, role playing, exercise training, assertiveness training, home assignments and behaviour contracting. CG: One attention control session (2 hours) including a didactic presentation on incidence and risks factors for falls, and watching a video on home hazards and steps to reduce these risks. Fear of falling was not addressed in this session.	6 weeks, 6 and 12 months	No significant difference between groups when all participants were considered in the analysis. However, time-on-treatment analysis revealed a significant difference in terms of change in falls efficacy between compliant (i.e. participants who attended 5 sessions or more) and control groups at the 6-week follow-up. This effect on falls efficacy scores was maintained at the 12-month follow-up.
Tinetti et al. (1994b)				
n = 301 (IG: n = 153; CG: n = 148)	Aged ≥ 70 years Ambulatory One or more fall risk factors No participation in vigorous sports or walking for exercise within the previous month	IG: An individualized assessment conducted at home by a nurse practitioner and physical therapist, followed by an intervention phase that lasted 3 months (mean home visits = 8). It included education about the appropriate use of medications, behavioural recommendations regarding postural hypotension, a review of medications with primary physician, environmental changes, training in transfer skills, gait training, balance exercises and strengthening exercises. Participants were instructed to perform the exercises twice a day (15-20 minutes each time). CG: Participants received only home visits from social-work students (mean home visits = 6).	Varied time frame (median of 4 ½ months)	Significant difference between groups. The mean change in falls efficacy scores was positive in the IG and negative in the CG.
van Haastregt et al. (2000)				
n = 316 (IG: n = 159; CG: n = 157)	Aged ≥ 70 years ≥ 2 falls in the previous 6 months or moderate impairments in mobility	IG: 5 multifactorial home visits by a community nurse over a year. The visits included screening for medical, environmental and behavioural factors causing falls and impairments in mobility. This was followed by specific advice, referrals, and other actions aimed at dealing with the hazards observed. CG: Usual care with not special attention or intervention on prevention of falls and impairments in mobility.	12 and 18 months	Significant difference between groups: Participants in the IG improved their falls efficacy whereas those in the CG remained stable.

Table 2. Detailed Description of Intervention Study Features and Findings (continued)

Total Sample and Group Sample Sizes*	Inclusion Criteria as Reported in Study	Description of Experimental and Control Group Conditions	Timeframe for Assessing Impact**	Findings Regarding Psychological Outcomes
Yates & Dunnagan (2001)				
n = 40 (IG: n = 20; CG: n = 20)	Aged > 65 years Living independently Ambulatory Not currently enrolled in a structured exercise program	IG: 10-week home-based intervention including fall risks education, exercise to improve strength, coordination, balance, and mobility exercises, nutrition counselling and/or referral, and environmental hazards education. Participants were encouraged to complete the 15-min exercise program 3 times a week). Each participant was given a set of 5-lb adjustable weights. The intervention included an individualized home assessment of environmental risk and appropriate recommendations to reduce hazards identified. CG: No intervention during the 10-weeks. Received the intervention following the 10-week experimental phase.	10 weeks	Significant difference between groups in terms of change in falls efficacy: The IG improved their falls efficacy more than the CG.
Zhang et al. (2005)				
n = 49 (IG: n = 25; CG: n = 24)	Aged ≥ 60 years Low ability for maintaining balance Ability to go out alone No prior experience of Tai Chi Chuan	IG: Tai Chi Chuan sessions (1-hr sessions, 7 times per week for 8 weeks) and a 30-min home program to practice when participants could not participate to a session or whenever they wished. CG: Participants were only instructed to continue their current level of physical activity.	8 weeks	Significant difference between groups: The mean FES score increased in IG but decreased in the CG.

* Values after randomization; ** Timeframe after baseline assessment or entry into the study; ✦ Findings reported by Zijlstra et al. (2007b); Abbreviations: IG = intervention group; CG = control group; IG1 = intervention group #1; IG2 = intervention group #2; GS = group sessions.

Table 3. Delivery Process, Content, and Impact of Multifaceted Interventions on Falls-Related Psychological Outcomes

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT				Barnett et al. (2003)	Clemson et al. (2004)	Devereux et al. (2005)	Gitlin et al. (2006)	Lin et al. (2007)	Reinsch et al. (1992)	Tennstedt et al. (1998)	Tinetti et al. (1994b)	Yates & Dunnagan (2001)
DELIVERY PROCESS	Setting		Community	•	•	•			•	•		
			Home		•		•	•			•	•
	Approach		Individualized approach		•		•	•			•	•
			Group approach	•	•	•			•	•		
	Professional Background of Interventionists		Health professional/Accredited exercise instructor	EI	OT	PT	OT/ PT	PH			N/ PT	
			Unspecified in the paper						•	•		•
INTERVENTION CONTENT	EXERCISES	Types of Exercises	Balance exercises	•	•	•	•		•		•	•
			Strengthening exercises	•	•	•	•		•	•	•	•
			Functional exercises (walking, transferring, reaching,...)	•	•				•		•	•
			Practice of falls-recovery techniques		•		•			•		
			Aerobic exercises	•		•						
			Other types of exercises	•		•			•			•
	EDUCATION	Topics	General information on fall risks and strategies	•	•	•			•	•		•
			Fear of falling		•					•		
			Physical activity		•	•				•		•
			Medication		•	•					•	•
			Osteoporosis		•	•						
			Vision		•							•
			Nutrition		•							•
			Environmental safety		•	•	•	•		•	•	•
			Behavioural safety		•		•			•	•	
			Footwear		•	•						
			Fall-recovery techniques		•					•		
			Other fall-related/health topics		•	•	•			•	•	•
		Methods	Individualized assessment		•		•	•			•	•
			Cognitive strategies		•	•	•		•	•		
			Verbal information/discussion		•	•	•		•	•	•	•
			Printed material	•	?	•	?			•		•
			Video							•		
			Other methods						•			
	Environmental		Home modifications				•	•			•	
	Other Specifications of Interventions		Home exercise program			•					•	•
			Consultation of physician to review medications								•	
			Water-based exercises			•						
			Booster session		•							
			Follow-up home visits/phone calls		•		•					
SUMMARY OF INTERVENTION IMPACT			Fear of falling	NS				NS	NS			
			Balance confidence									
			Falls efficacy		✓*	NS	✓			✓**	✓	✓

Abbreviations and symbols: EI = accredited exercise instructor; PT = physical therapist; OT = occupational therapist; N = nurse; PH = public health worker; ✓ = significant impact of intervention; NS = no significant impact of intervention; [✓] = significant change from pre to post score within the intervention group; [NS] = no significant change from pre to post score within the intervention group; *Significant impact on the MES scores but non significant impact on the FES scores. **Significant impact on falls efficacy in compliant participants only.

Table 4. Delivery Process, Content, and Impact of Exercise Interventions on Falls-Related Psychological Outcomes

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT			Arai et al. (2007)	Brouwer et al. (2003)	Campbell et al. (1997)	Delbaere et al. (2006)	Hinman et al. (2005) *Computerized balance training*	Hinman et al. (2005) *Home program of balance exercises*
DELIVERY PROCESS	Setting	Community						
		Clinical/Laboratory/Academic	●	●			●	
		Home			●	●		●
		Unspecified in the paper						
	Approach	Individualized approach			●	●	●	●
		Group approach	●	●				
	Professional Background of Interventionists	Health professional	IT	PT	PT	PT		
		Tai Chi instructor or accredited exercise instructor						
		Unspecified in the paper					●	●
INTERVENTION CONTENT	Types of Exercises	Tai Chi program						
		Balance exercises	●		●	●	●	●
		Strengthening exercises	●	●	●	●		
		Functional exercises (walking, transferring, reaching,...)	●	●				●
		Aerobic exercises				●		
		Other types of exercises			●	●		
	Other Specifications of Interventions	Home exercises program		●	●	●		●
		Computerized training					●	
		Printed material on falls prevention						
		Follow-up (phone calls, home visits)			●			●
SUMMARY OF INTERVENTION IMPACT		Fear of falling				✓		
		Balance confidence		NS [✓]				
		Falls efficacy	[NS]		✓		NS	NS

Table 4. Delivery Process, Content, and Impact of Exercise Interventions on Falls-Related Psychological Outcomes (continued)

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT			Li et al. (2005)	Lin et al. (2007)	Liu-Ambrose et al. (2004) *Resistance training*	Liu-Ambrose et al. (2004) *Agility training*	McCormack et al. (2004) *Conventional exercise*	McCormack et al. (2004) Holistic *group exercise*
DELIVERY PROCESS	Setting	Community	●		●	●		
		Clinical/Laboratory/Academic						
		Home		●				
		Unspecified in the paper					●	●
	Approach	Individualized approach		●				
		Group approach	●		●	●	●	●
	Professional Background of Interventionists	Health professional		PT				
		Tai Chi instructor or accredited exercise instructor	●		●	●		
		Unspecified in the paper					●	●
INTERVENTION CONTENT	Types of Exercises	Tai Chi program	●					●
		Balance exercises		●		●		
		Strengthening exercises		●	●		●	
		Functional exercises (walking, transferring, reaching,...)		●		●	●	
		Aerobic exercises					●	
		Other types of exercises				●	●	●
	Other Specifications of Interventions	Home exercises program		●				
		Computerized training						
		Printed material on falls prevention						
		Follow-up (phone calls, home visits)						
SUMMARY OF INTERVENTION IMPACT		Fear of falling	✓	✓				
		Balance confidence	✓		[✓]	[✓]		
		Falls efficacy					✓	NS

Table 4. Delivery Process, Content, and Impact of Exercise Interventions on Falls-Related Psychological Outcomes (continued)

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT			Nitz & Low Choy (2004) *Workstation*	Nitz & Low Choy (2004) *Traditional exercise program*	Reinsch et al. (1992)	Robertson et al. (2001)	Sattin et al. (2005)	Sihvonen et al. (2004)
DELIVERY PROCESS	Setting	Community		●	●		●	
		Clinical/Laboratory/Academic	●					●
		Home				●		
		Unspecified in the paper						
	Approach	Individualized approach				●		●
		Group approach	●	●	●		●	
	Professional Background of Interventionists	Health professional	PT	PT		N		
		Tai Chi instructor or accredited exercise instructor					●	
		Unspecified in the paper			●			●
INTERVENTION CONTENT	Types of Exercises	Tai Chi program					●	
		Balance exercises	●		●	●		●
		Strengthening exercises	●		●	●		
		Functional exercises (walking, transferring, reaching,...)	●	●	●			
		Aerobic exercises		●				
		Other types of exercises	●	●	●	●		
	Other Specifications of Interventions	Home exercises program				●		
		Computerized training						●
		Printed material on falls prevention	●	●				
		Follow-up (phone calls, home visits)				●		
SUMMARY OF INTERVENTION IMPACT		Fear of falling			NS			[✓]
		Balance confidence					✓	
		Falls efficacy	[NS]	[NS]		✓	✓	

Table 4. Delivery Process, Content, and Impact of Exercise Interventions on Falls-Related Psychological Outcomes (continued)

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT			Wallsten et al. (2006)	Weerdesteyn et al. (2006)	Wolf et al. (1996) *Tai Chi program*	Wolf et al. (1996) *Computerized balance training*	Wolf et al. (2001)	Zhang et al. (2005)
DELIVERY PROCESS	Setting	Community	●		●			●
		Clinical/Laboratory/Academic				●	●	
		Home					●	
		Unspecified in the paper		●				
	Approach	Individualized approach				●	●	
		Group approach	●	●	●			●
	Professional Background of Interventionists	Health professional					PT	
		Tai Chi instructor or accredited exercise instructor	●					●
		Unspecified in the paper		●	●	●		
INTERVENTION CONTENT	Types of exercises	Tai Chi program	●		●			●
		Balance exercises		●		●	●	
		Strengthening exercises					●	
		Functional exercises (walking, transferring, reaching,...)		●			●	
		Aerobic exercises					●	
		Other types of exercises		●			●	
	Other Specifications of Interventions	Home exercises program						●
		Computerized training						
		Printed material on falls prevention						
		Follow-up (phone calls, home visits)						
SUMMARY OF INTERVENTION IMPACT		Fear of falling			✓	NS	NS	
		Balance confidence	NS	✓				
		Falls efficacy						✓

Abbreviations and symbols: IT = interdisciplinary team; PT = physical therapist; ✓ = significant impact of intervention; NS = no significant impact of intervention; [✓] = significant change from pre to post score within the intervention group; [NS] = no significant change from pre to post score within the intervention group.

Table 5. Delivery Process, Content, and Impact of Educational Interventions on Falls-Related Psychological Outcomes

INTERVENTIONS' CONTENT, DELIVERY, AND IMPACT				Brouwer et al. (2003)	Gallagher & Brunt (1996)	Huang et Acton (2004)	Reinsch et al. (1992)	Sattin et al. (2005)	van Haastregt et al. (2000)
DELIVERY PROCESS	Setting		Community				●	●	
			Academic	●					
			Home		●	●			●
	Approach		Individualized approach		●	●			●
			Group approach	●				●	
	Professional Background of Interventionists		Health professional	PT	N	N			N
			Unspecified in the paper				●	●	
INTERVENTION CONTENT	EDUCATION	Topics	General fall-related info	●		●	●	●	●
			Fear of falling	●					●
			Physical activity	●				●	
			Medication		●	●		●	●
			Osteoporosis						
			Vision		●				
			Nutrition	●				●	
			Environmental safety	●	●	●			●
			Behavioural safety						●
			Footwear	●					
			Fall recovery techniques	●					
			Other fall-related/health topics		●			●	●
		Methods	Assessment of fall risks factors		●	●			●
			Cognitive strategies				●		
			Verbal information/discussion	●	●	●		●	●
			Printed material on falls prevention & resources	●	●	●		●	
			Video		●				
			Relaxation techniques				●		
			Videogames				●		
	Other dimension		Referrals						●
SUMMARY OF INTERVENTION IMPACT			Fear of falling		NS		NS		
			Balance confidence	NS [✓]				NS	
			Falls efficacy		NS	✓			✓

Abbreviations and symbols: PT = physical therapist; OT = occupational therapist; N = nurse; ✓ = significant impact of intervention; NS = no significant impact of intervention; [✓] = significant change from pre to post score within the intervention group; [NS] = no significant change from pre to post score within the intervention group.

CHAPITRE 5 -

IMPLEMENTING A COMMUNITY-BASED FALLS PREVENTION PROGRAM: FROM DRAWING BOARD TO REALITY (ARTICLE 2)

Johanne Filiatrault, erg., M.Sc., doctorante

Manon Parisien, erg., M.Sc.

Sophie Laforest, Ph.D.

Carole Genest, B.Sc.

Lise Gauvin, Ph.D.

Michel Fournier, M.A.

Francine Trickey, M.Sc.

Yvonne Robitaille, Ph.D.

Article publié dans la revue *Canadian Journal on Aging*,

Volume 26, numéro 3, pages 213 à 225.

Contribution des auteurs

Titre de l'article:

Implementing a community-based falls prevention program:

From drawing board to reality

Johanne Filiatrault et Manon Parisien ont développé conjointement les idées traitées dans cet article. **Johanne Filiatrault** était responsable de faire les liens entre les idées et les écrits scientifiques et professionnels, de réaliser les analyses statistiques et de rédiger cet article. **Manon Parisien** est l'une des principales conceptrices du programme PIED. Elle a collaboré à la collecte de données auprès des organismes du milieu communautaire et elle était coresponsable de la rédaction de l'article.

Sophie Laforest, Carole Genest et Francine Trickey font partie de l'équipe ayant élaboré le programme PIED et ont collaboré à ce titre à la rédaction de l'article.

Lise Gauvin a guidé l'étudiante à travers les diverses étapes de réalisation de cet article et a contribué à la rédaction.

Michel Fournier a contribué à la rédaction de cet article.

En tant que chercheure responsable du projet d'évaluation de l'efficacité du programme PIED, **Yvonne Robitaille** a participé à la conceptualisation initiale de l'article, de même qu'à sa rédaction. Elle est également l'une des conceptrices du programme.

Accord des coauteurs et permission de l'éditeur

Johanne Filiatrault a obtenu l'accord des coauteurs et la permission de l'éditeur d'inclure l'article intitulé « Implementing a community-based falls prevention program: From drawing board to reality » dans cette thèse de doctorat (voir formulaires aux annexes 6 et 7).

IMPLEMENTING A COMMUNITY-BASED FALLS PREVENTION PROGRAM: FROM DRAWING BOARD TO REALITY

Johanne Filiatrault, O.T., M.Sc.[1,2,3,4],

Manon Parisien, O.T., M.Sc.5, Sophie Laforest, Ph.D.[3,5,6],

Carole Genest, B.Sc.[1], Lise Gauvin, Ph.D. [3,7,8], Michel Fournier, M.A.[9],

Francine Trickey, M.Sc.[9], and Yvonne Robitaille, Ph.D. [1,7,10]

Johanne Filiatrault, O.T., M.Sc. (corresponding author):
Affiliations : [1]Institut national de santé publique du Québec; [2]Programme de doctorat en santé publique, Université de Montréal; [3]Groupe de recherche interdisciplinaire en santé (GRIS); [4]École de réadaptation, Université de Montréal.
Mailing address : École de réadaptation, Université de Montréal, C.P. 6128, succursale Centre-ville, Montréal, Québec, Canada, H3C 3J7.
[redacted]. Phone number : (514) 343-6111 (ext. 0836). Fax number : (514) 343-2105.

Manon Parisien, O.T., M.Sc.:
Affiliation : [5]Centre de Santé et de Services sociaux Cavendish - Centre affilié universitaire en gérontologie sociale.
Mailing address : 5800 boul. Cavendish, Côte-Saint-Luc, Québec, Canada, H4W 2T5.
[redacted] [redacted]. Phone number : (514) 488-3673 (ext. 1553). Fax number : (514) 528-2453.

Sophie Laforest, Ph.D.:
Affiliations : [6]Département de kinésiologie, Université de Montréal; [3]Groupe de recherche interdisciplinaire en santé (GRIS); [5]Centre de Santé et de Services sociaux Cavendish - Centre affilié universitaire en gérontologie sociale.
Mailing address : Département de kinésiologie, Université de Montréal, C.P. 6128, succursale Centre-ville, Montréal, Québec, Canada, H3C 3J7.
[redacted] [redacted]. Phone number : (514) 343-5623. Fax number : (514) 343-2181.

Carole Genest, B.Sc.:
Affiliations : [1]Institut national de santé publique du Québec.
Mailing address : Institut national de santé publique du Québec, 190 boul. Crémazie Est, Montréal, Québec, Canada, H2P 1E2.
[redacted] Phone number : (514) 864-1600 (ext 3553). Fax number : (514) 864-5190.

Lise Gauvin, Ph.D.:
Affiliations : [7]Département de médecine sociale et préventive, Université de Montréal; [3]Groupe de recherche interdisciplinaire en santé (GRIS); [8]Centre de recherche Léa-Roback sur les inégalités sociales de santé de Montréal.
Mailing address : Département de médecine sociale et préventive, Université de Montréal, C.P. 6128, succursale Centre-ville, Montréal, Québec, Canada, H3C 3J7.
[redacted] Phone number : (514) 343-6087. Fax number : (514) 343-5645.

Michel Fournier, M.A.:
Affiliation : [9]Direction de santé publique de Montréal.
Mailing address : Direction de santé publique de Montréal, 1301 Sherbrooke Est, Montréal, Québec, Canada, H2L 1M3.
[redacted] Phone number : (514) 528-2400 (ext. 3457). Fax number : (514) 528-2453.

Francine Trickey, M.Sc.:
Affiliation : [9]Direction de santé publique de Montréal.
Mailing address : Direction de santé publique de Montréal, 1301 Sherbrooke Est, Montréal, Québec, Canada, H2L 1M3.
[redacted]. Phone number : (514) 528-2400 (ext. 3369). Fax number : (514) 528-2426.

Yvonne Robitaille, Ph.D.:
Affiliations : [1]Institut national de santé publique du Québec; [7]Département de médecine sociale et préventive, Université de Montréal; [10]Department of Epidemiology and Biostatistics, McGill University.
Mailing address : Institut national de santé publique du Québec, 190 boul. Crémazie Est, Montréal, Québec, Canada, H2P 1E2.
[redacted] Phone number : (514) 864-1600 (ext. 3716). Fax number : (514) 864-1616.

Running head: Implementing a falls prevention program

Key words: Falls prevention, program implementation, community-based organizations, community-dwelling seniors

Mots clés: Prévention des chutes, implantation d'un programme, organismes du milieu communautaire, aînés vivant dans la communauté

ABSTRACT

Several studies have demonstrated the efficacy of falls prevention programs designed for community-dwelling seniors using randomized designs. However, little is known about the feasibility of implementing these programs under natural conditions and about the success of these programs when delivered under such conditions. The objectives of this paper are to: 1) describe a multifactorial falls prevention program (called *Stand Up!*) designed for independent community-dwelling seniors, and 2) present the results of an analysis of the feasibility of implementing this program in community-based settings. The program was implemented in the context of an effectiveness study in 10 community-based organizations in the Montreal metropolitan area. Data pertaining to the reach and delivery of the program as well as participation level show that a falls prevention program addressing multiple risk factors can be successfully implemented in community-based settings.

RÉSUMÉ

Plusieurs études ont démontré, à l'aide de devis randomisés, l'efficacité de programmes de prévention des chutes destinés aux aînés vivant dans la communauté. Cependant, on connaît peu de choses quant à la faisabilité d'implanter ces programmes dans des conditions naturelles et quant à l'efficacité de ces programmes lorsqu'ils sont offerts dans de telles conditions. Les objectifs de cet article sont de: 1) décrire un programme multifactoriel de prévention des chutes (PIED) destiné à des aînés autonomes vivant dans la communauté et 2) présenter les résultats d'une analyse de la faisabilité d'une implantation du programme dans les organismes communautaires. Le programme a été implanté dans 10 organismes du milieu communautaire situés dans la région métropolitaine de Montréal dans le contexte d'une étude d'efficacité. Les résultats concernant la population recrutée et la façon dont le programme a été offert, ainsi que le niveau de participation au programme montrent qu'un programme de prévention des chutes visant plusieurs facteurs de risque peut être implanté avec succès dans des milieux communautaires.

ACKNOWLEDGMENTS

The study reported in this paper was supported by the Canadian Institutes of Health Research (Grant No. MOP 53123). The study was also supported by the Regional Health and Social Services Boards of Montreal, Laval, and Montérégie who provided seed monies for program implementation in community-based organizations. Johanne Filiatrault was supported by doctoral fellowships from the Fonds de la recherché en santé du Québec (FRSQ) and the Ordre des ergothérapeutes du Québec (OEQ). The authors would like to thank seniors and collaborators from community-based organizations for their participation in the study.

INTRODUCTION

Falls among seniors are a major public health concern because they have a high incidence and represent substantial personal and societal burdens (Marks & Allegrante, 2004). Consequently, many falls prevention initiatives have been developed across Canada (Public Health Agency of Canada, 2005). Over the past decade, numerous studies evaluating the impact of falls prevention programs designed for community-dwelling seniors have been published. Reviews of randomized clinical trials show that programs including exercises and targeting multiple risk factors are effective in reducing falls incidence (Chang, Morton, Rubenstein, Mojica, Maglione, Suttorp, Roth, & Shekelle, 2004; Gillespie, Gillespie, Robertson, Lamb, Cumming, & Rowe, 2003; Weatherall, 2004).

Although randomized clinical trials are of an incontestable value in establishing intervention efficacy, researchers have recently underscored the importance of other types of studies such as effectiveness trials (Glasgow, Lichtenstein, & Marcus, 2003; Victora, Habicht, & Bryce, 2004). It is argued that it is not sufficient to show that a program is effective under controlled conditions but that it is also crucial to demonstrate if it can reach its objectives when implemented under natural conditions (Prohaska, Belansky, Belza, Buchner, Marshall, McTigue, Satariano, & Wilcox, 2006). Indeed, the natural heterogeneity that characterizes real-world settings implies that implementation conditions are likely to vary from one setting to another. As a result, the prerequisite conditions for program success such as appropriate reach, delivery, and exposure may not be present. Therefore, questions like "*Are practice milieus able to recruit the target population?*", "*Are they* *able to deliver the intervention as intended?*" and "*Are they able to ensure optimal participation in the program?*" are essential to address. In sum, the feasibility of implementing a program in natural settings must also be demonstrated. Unfortunately, there is a gap in the falls prevention literature on this issue. Therefore, the objectives of this paper were to describe a multifactorial falls prevention program (called *Stand Up!*) designed for independent community-dwelling seniors and to present the results of an analysis of the feasibility of implementing this program in community-based settings. More specifically, we chose to examine if community-based organizations were able to meet the three prerequisite criteria for program success: 1) reaching the target population, 2) delivering the program according to program guidelines, and 3) achieving sufficient program participation rates. Towards these ends, we first describe the program goals, components, training principles, conceptual models, underlying logic model, as well as program outcomes. Next, we describe how the intervention was delivered in 10 community-based organizations participating in an effectiveness study to draw inferences about program reach, delivery, and participation level.

The Intervention

Stand Up! (or PIED for Programme intégré d'équilibre dynamique in French) is a multifactorial falls prevention program developed in 1995 by interventionists and researchers from the Montreal Public Health Department in collaboration with physical activity and rehabilitation experts and representatives of community-based organizations. *Stand Up!* was designed to meet the needs of independent community-dwelling seniors with special emphasis on people who have a history of falls, people who are afraid of falling, or people concerned about their balance

(Trickey, Parisien, Laforest, Genest, & Robitaille, 2003). Like most interventions, *Stand Up!* was created through iterative steps. Table 1 outlines the chronology of its development and evaluation.

[Insert Table 1 here]

Stand Up! is a 12-week program that aims at modifying a variety of risk factors. It consists of three components: group exercise classes (one hour, twice per week), a home exercise module (30 minutes practice, at least once per week), and information/discussion classes (30 minutes, once per week). *Stand Up!* has five specific goals: 1) improve balance and leg strength, 2) develop skills required to reduce home hazards and adopt fall-safe behaviours, 3) enhance feelings of efficacy related to falls prevention, 4) maintain bone density, and 5) encourage regular involvement in physical activity.

Table 2 outlines evidence-based training principles that guided the conception of exercise components and provides examples of how they were integrated into the program (American College of Sports Medicine, 2000; Duncan, Chandler, Studenski, Hughes, & Prescott, 1993; Topp, Mikesky, & Bawel, 1994). The group exercise component of the program aims at improving dynamic balance, strength, flexibility, and proprioception. Each exercise class is divided into four phases: 1) warm-up (with lower limb proprioception and ankle flexibility exercises), 2) dynamic balance exercises (with obstacle courses and movements inspired from Tai Chi), 3) strengthening exercises (using Therabands® to strengthen hip abductors), and 4) stretching and relaxation.

The home exercise component consists of 12 simple exercises to be performed independently by participants at least once a week during the 12-week program and a few times each week when the program is completed. These exercises are explained and practiced during the first exercise class and are illustrated on a small poster that can be used at home as a reminder and practice guide.

[Insert Table 2 here]

The educational component of *Stand Up!* includes 10 weekly 30 minutes information/discussion classes. To optimize program participation, these classes are held at the beginning or at the end of an exercise class. As shown in Figure 1, the PRECEDE/PROCEED model (Green & Kreuter, 2005) was used as a guide during the planning phase of this component of the program. The educational approach suggested for these classes was inspired from health behaviour models (Bandura, 1977; Bandura, 1986; Rosenstock, 1990). Information/discussion classes focus on participants' personal experience and on learning through modeling, personal reflection, experimentation, and positive reinforcement. They cover topics such as strategies to increase home safety, fall-safe behaviours, osteoporosis prevention, appropriate shoes, safe drug consumption, and exercise maintenance.

[Insert Figure 1 here]

The program was designed to be offered by community-based organizations to groups of 10 to 15 seniors. However, since *Stand Up!* targets independent seniors who may present mild balance alterations, it should be delivered by experienced rehabilitation or exercise professionals. A detailed program guide is available to instructors in English and French (Trickey, Parisien, Laforest, Genest, & Robitaille, 2002; Trickey at al., 2003). This guide provides helpful tools for each step of the implementation process. It also includes a physical screening questionnaire (named the Capacity-for-Exercise grid) that was especially developed to screen out seniors who are unable to perform relatively demanding exercises within a group context. This grid includes questions regarding physical capacity such as "Can you walk two blocks without getting out of breath or so tired you need to sit down?" and a series of questions addressing health problems. A one day training session is available to prepare professionals to become *Stand Up!* instructors. More information about the program and a list of available publications can be found on the Web site of the Montreal Department of Public Health (see www.santepub-mtl.qc.ca/programmechute/publications.html and www.santepub-mtl.qc.ca/programmechute/standup.html).

Figure 2 illustrates the program's logic model. It shows the linkages between *Stand Up!*'s components and its expected outcomes. It also highlights three prerequisite conditions for the program's success: that the program reaches its target population (*program's reach*), that the program be offered as intended (*program's delivery*), and that participants attend a reasonable number of exercise classes (established for this study as 75 per cent of the classes or more), and comply with the home exercise module (*program's exposure*).

[Insert Figure 2 here]

PROGRAM OUTCOMES

As indicated in Table 1, an effectiveness study recently showed that *Stand Up!* improved static balance and mobility among independent community-dwelling seniors recruited through community-based organizations (Robitaille, Laforest, Fournier, Gauvin, Parisien, Corriveau, Trickey, & Damestoy, 2005). This study was conducted with a sample of 200 community-dwelling seniors aged over 60 years and living in the Montreal metropolitan area. Ninety-eight participants were recruited from 10 community-based organizations considered as “intervention sites” and 102 participants were recruited from seven community-based organizations considered as “control sites”. A series of variables including static balance and mobility performance were measured at baseline, immediately after the intervention (post-test), as well as 3 months, and 9 months after the completion of the intervention. An analysis of program outcomes at post-test showed that static balance and mobility improved more among participants in intervention sites than among participants in control sites (Robitaille et al., 2005).

METHODS

RECRUITMENT OF ORGANIZATIONS INTO THE EFFECTIVENESS STUDY

The effectiveness study was approved by the Montreal Regional Health and Social Services Board's ethics committee which ascribes to the Tri-Council Ethics Statement and Procedures. To recruit organizations for the effectiveness study, an invitation was sent to representatives of community-based organizations that had previously expressed interest in the program. Representatives of 10 organizations agreed to recruit experimental participants for the effectiveness study and to implement the program in their community. Seven organizations agreed to recruit control participants for the effectiveness study and wait until the end of the study's experimental phase (i.e., 12 months) to offer the program. To offer the program, organizations received "seed monies" from regional health authorities. The 12-week program costs about $1900 CAD including material expenses and professional fees.

Among the 10 organizations in charge of implementing the program, six were senior community centers and four were community health centers. They were located in cities and suburbs characterized by a range of levels of affluence. Only five organizations were providing group exercises on a regular basis prior to the study. Seven of the 10 organizations established partnerships with other organizations of the community to implement the program. This allowed for a sharing of responsibilities (recruitment of participants, organization of space and material, leading group classes) between organizations.

For the effectiveness study, representatives of community-based organizations were asked to recruit community-dwelling seniors aged over 60 years who were exempt from cognitive deficits and disabling conditions, have the required capacities to get involved in a group exercise program, and were able to speak either English or French. Representatives of community-based organizations were also encouraged to use key words such as falls, balance, strength, healthy bones, and exercises for their advertising, in order to recruit seniors that represented *Stand Up!* target population. All study participants were informed about the research objectives and process and signed a consent form. They were also informed that data collected would remain confidential. Participants who were recruited to receive the intervention were also informed of the potential risks associated with participation in the program.

Measures

Population Reached. Information about participants was collected though a structured face-to-face interview one week prior to the beginning of the program. The questionnaire tapped into socio-demographic characteristics and other variables such as perceived health status assessed with a question from the Canadian Community Health Survey (Statistics Canada, 2000). To examine the match between recruited participants and the program' target population, data about perceived balance, falls/near falls, and fear of falling were also collected. Perceived balance was assessed with a single item dealing with one's overall perception of balance on a 10-point ordinal scale. Falls and near falls were assessed by asking participants if they had experienced falls or near falls in the previous 12 months. Fear of falling was assessed by asking participants if they were afraid of falling using a 4-category response scale (never, occasionally, often, and very often). Since the effectiveness study focused on participants' balance, a battery of balance performance tests was also administered by trained physical therapists prior to and following the program. The battery included the One-Legged Stance and Tandem Stance tests for static balance, the Functional Reach and Lateral Reach tests for stability limits, and the Tandem Walk test for mobility (Baloh, Fife, Zwerling, Socotch, Jacobson, Bell, & Beykirch, 1994; Brauer, Burns, & Galley, 1999; Duncan, Weiner, Chandler, & Studenski, 1990; Franchignoni, Tesio, Martino, & Ricupero, 1998).

Program Delivery. To determine the extent to which the program was delivered as recommended by program guidelines, we examine the following dimensions: 1) participants recruitment and selection, 2) group format, 3) instructor background and leadership style, and 4) application of exercise training principles. Program delivery was examined through two assessment methods. First, a trained research assistant observed one exercise class in each organization between the fourth and eighth weeks of the program and used a checklist describing instructor's leadership style and instructor's reliance on the program's training principles during group exercises. Second, a structured telephone interview was conducted by another research assistant with the coordinator and group instructor from each community-based organization at the end of the program. This interview included questions about the leader's professional background and about participants' recruitment and selection, group format as well as reliance on the program's training principles during group exercises.

Program Participation. The level of participation in *Stand Up!* was examined through two indicators: attendance to group exercise classes and compliance with the home exercise module. A record of participants' attendance at each class was maintained by each group instructor to allow for compilation of each participant's attendance rate. Compliance with the home exercise module was self-reported and recorded through a structured interview conducted one week after the end of the program with each participant.

Data Analysis

Except for program delivery which was analyzed at the organizational level, all analyses were performed at the individual level. Descriptive statistics (mean, standard deviation, and proportions) were computed to develop a profile of participants in terms of socio-demographic characteristics, perceived health status, falls/near falls, fear of falling, and perceived balance. Individual-level data were also used to examine participation level in the program. The absolute number of organizations meeting each program guideline was used to examine organizational compliance with each program guideline.

Statistical procedures were applied to compare subgroups of participants: 1) participants who attended 75 per cent or more of the group exercises classes with those who attended less than 75 per cent of classes, and 2) participants who practiced home exercises at least once a week as suggested in the program guide with those who practiced home exercises less often. Comparisons were made on a series of characteristics including socio-demographic variables, perceived health, falls/near falls, fear of falling, perceived balance, and balance performance. Student t-tests were used with continuous variables such as age, perceived balance, and balance performance. When required, transformations were performed to achieve normality prior to statistical testing. When transformations did not result in normal distributions, variables were categorized through a tertile split. For categorical variables, we applied chi-square tests to examine if proportions of persons falling into each subgroup differed.

RESULTS

Match between Population Reached and Target Population

Table 3 shows participants' characteristics at their entry into the study. Participants were heterogeneous in terms of socio-demographic and health characteristics although most participants were women (84 % of participants). Table 3 also indicates that almost 40 per cent of participants reported having experienced one or several falls in the previous 12 months and that 26 per cent of participants reported having experienced near falls in the previous 12 months. Twenty-six percent of participants reported experiencing fear of falling often or very often whereas 38 per cent experienced fear of falling occasionally. Only 13 per cent of participants considered their balance as weak (i.e., score < 5 on a 1 to 10-point rating scale). More than half of participants considered their balance as moderate (i.e., score of 5, 6, or 7).

[Insert Table 3 here]

Analysis of participants' characteristics at entry into the program revealed that 50 per cent of participants were seniors who met <u>one or several</u> of the following criteria which defines the program's core target population: 1) experienced one or several falls in the previous year, 2) experienced fear of falling often or very often, and 3) perceived their balance as weak. Another 37 per cent of participants met <u>one or several</u> of the following criteria which define what could be called the program's secondary target population: 1) experienced one or several near falls in the previous 12 months, 2) declared being "occasionally afraid of falling", and 3) perceived their balance as moderate. The remaining 13 per cent of participants did not meet any of the criteria related to the program's target population.

MATCH BETWEEN PROGRAM DELIVERY AND PROGRAM GUIDELINES

Table 4 outlines the number of community-based organizations meeting each of the program's guidelines. In general, compliance of community-based organizations with these guidelines was good. More specifically, every organization used several recruitment strategies as recommended in program guidelines. The most frequent strategies adopted by organizations were information sessions about the program during a seniors' community activity, ads in local newspapers, and use of printed materials. Thirty-three per cent of participants reported having heard about the program through an information session during a seniors' community activity. Other participants indicated being provided information about *Stand Up!* through family and friends (18 %), a health professional (18 %), an ad in a local journal (16 %), and consultation of other written material such as a poster or a pamphlet (15 %). The Capacity-for-Exercise grid was used in all community-based organizations although a few instructors did not systematically collect the medical authorization form when required.

The size of each group of participants was also in keeping with *Stand Up!* guidelines. It varied from 5 to 15 participants (mean = 10). However, no instructor turned to a co-leader for assistance when groups included more than 10 participants. Group leaders were mostly physical therapists (n = 4) and physical rehabilitation therapists (n = 5). Other leaders included an occupational therapist and a physical educator. Data regarding reliance of instructors on training principles for exercises showed that the personalization of exercises was respected by every instructor. Also, most instructors respected the gradation principle for exercise intensity and corrected participants' position to prevent adverse effects. However, some instructors failed to call-up absent participants or to encourage participants to practice their exercises at home.

[Insert Table 4 here]

Program Participation

The attendance records showed that among the 98 participants, 10 dropped out of the program. Of these, five did so during the first two weeks of the program. Dropouts did not differ from the other participants in terms of age, gender, health status, falls, and fear of falling (all p-values > 0.05). The average attendance rate among the participants including dropouts was 78 per cent. This rate accounted for the total number of classes provided by community-based organizations which varied between 19 and 24 sessions. The most frequent reasons reported by participants for missing a group class were a health problem (20 %) or an engagement in another social or familial activity (13 %).

Compliance with the home exercise module was recorded for 88 participants. At the end of the program, 79 per cent of these participants reported having practiced *Stand Up!* home exercises at least once a week. Moreover, 55 per cent of these participants reported having practiced home exercises at least twice a week.

We compared seniors who participated in a minimum of 75 per cent of group exercise classes (higher attendance subgroup) with seniors whose attendance rate was less than 75 per cent of classes (lower attendance subgroup). This cut-off point was chosen following an examination of the distribution of attendance rates and based on the minimum exposure level that was thought to be required to achieve the program's goals. Results shown in Table 5 indicate that scores on the One-Legged Stance (eyes open, left side), the One-Legged Stance (eyes closed, right and left sides) and the Functional Reach tests at entry into the program were significantly lower for participants who did not attend 75 per cent of classes indicating a lower initial balance performance in the lower attendance subgroup. However, we did not observe any other significant differences between these subgroups of participants in terms of perceived health, falls/near falls history, and fear of falling. It is interesting to note that a large majority seniors (i.e., 90 %) who did not attend 75 per cent of group exercise classes were compliant to the home exercise component of the program (i.e., they practiced home exercises at least once a week).

We also compared seniors who reported having performed the home exercise module at least once a week (compliant subgroup) with seniors who did not perform the home exercise module on a weekly basis (less compliant subgroup). We observed that seniors who were less compliant with the home exercise module had higher scores on the One-Legged Stance (eyes open, right and left sides), the One-Legged Stance (eyes closed, right side), and the Lateral Reach (right and left sides) tests at entry into the program in comparison to participants who were compliant with the home exercise module. However, most of these less compliant seniors (i.e., 89 %) attended more than 75 per cent of group exercise classes. We did not observe any other significant differences between compliant and less compliant seniors' characteristics.

[Insert Table 5 here]

DISCUSSION

The objectives of this paper were to describe a multifactorial falls prevention program (called *Stand Up!*) that was designed for independent community-dwelling seniors and to present the results of an analysis of the feasibility of implementing this program in community-based settings. Although there was heterogeneity across implementation contexts, community-based organizations were successful in recruiting the target population and in delivering *Stand Up!* according to program guidelines. In addition, attendance rates and compliance levels were in the range required to result in measurable differences in terms of balance, a major factor to consider for the prevention of falls. These data suggest that *Stand Up!* can successfully be implemented in community-based organizations in urban and suburban areas.

Successful recruitment into the program might result from the clear marketing message and the variety of recruitment strategies that were used by community-based organizations. Furthermore, results suggest that community-dwelling seniors are able to establish the suitability of a falls prevention program like *Stand Up!* as only 18 per cent of participants were referred to the program by a health professional. Thus, the registration of a majority of seniors rested on their self-assessment about the program's appropriateness for their needs and capacities. As for the remaining 13 per cent of participants who did not meet any of the criteria related to the program's target population, they may have registered for *Stand Up!* for other reasons such as socialization, general fitness, or stress relief purposes. Such motives have been noted as reasons reported by adults for engaging in physical activity (Sherwood & Jeffery, 2000). Further analysis showed that these 13 per cent of participants were more likely to participate in other activities scheduled within their respective community-based organization. Unfortunately, no other data were collected regarding possible motives for program enrolment. It is also interesting to note that this type of program seems to appeal to seniors of different ages, education levels, living conditions, and perceived health status. However, the program drew proportionately more women (84 % of the sample). This proportion is above and beyond the actual proportion of women (i.e., 60 %) found in the elderly population (Institut national de santé publique du Québec, 2006). This is consistent with other data showing that women are more likely to seek out preventive services than men (Bertakis, Azari, Helms, Callahan, & Robins, 2000).

Overall, the program guidelines were well-followed within community-based organizations as shown in Table 4. Many factors may have contributed to this positive result. First, the fact that *Stand Up!*'s content rested on evidence-based principles provided credibility to the program and might have facilitated its adoption and reliable delivery by professionals. Second, the availability of a user-friendly guide, formal training, and access to professional support from the Montreal Public Health Department likely contributed to compliance with program guidelines. Third, *Stand Up!* was developed in partnership with community-based organizations. This allowed for the creation of a program that was realistic in terms of human and physical resources. Finally, the financial support likely acted as an incentive for reliable program delivery.

Selected elements were not applied optimally. In the future, program guidelines and instructor training should further emphasize the importance of: 1) collecting medical authorization forms from seniors presenting specific risks (as detected by the Capacity-for-Exercise grid) prior to entry into the program, 2) encouraging participants to practice home exercises between group exercise classes to meet frequency of exercise requirements of the program, and 3) following-up with participants who missed a group exercise class. Results also show that instructors did not rely on a co-leader when groups included more than 10 participants. This might reflect a lack of available human resources for applying such a recommendation.

The average attendance rate to group sessions (78 %) and the compliance levels with the home exercise module (79 %) were very good considering that there were no incentives (e.g., transport, money) for participating in the program. These results are somewhat comparable to those reported in the literature for similar programs (Jette, Harris, Sleeper, Lachman, Heislein, Giorgetti, & Levenson, 1996; Lord & Castell, 1994). This high level of participation to the program can be attributed to several factors. First, participants' attendance in the program might be partially explained by their concern about balance and falls. Second, the fact that group exercises involved a gradual increase in difficulty level while allowing for personalization provides an environment that is favourable to developing self-efficacy for exercise involvement (Dishman, 1994). Finally, the use of humour, the competence and dynamism of instructors, and the positive feedback from instructors and other participants are other factors that might have influenced positively participation rates (Oakley, Dawson, Fullerton, Holland, Arnold, Cryer, Doyle, Rice, & Hodgson, 1996).

Analysis of individual factors associated with group attendance suggests that more strategies should be included in the program to enhance group participation for seniors presenting lower levels of balance. However, the fact that participants who attended less than 75 per cent of group exercise classes were compliant with the home exercise module suggests that the mixed approach chosen for *Stand Up!* (that is a group approach combined with a home exercise program) is appropriate. Such an approach allows reaching seniors who may respond more favourably to either a group format or an individual format for exercise practice.

Study Limitations and Future Directions for Research

Findings from the present investigation suggest that *Stand Up!* is a community falls prevention program that can be successfully implemented in community-based settings in urban and suburban areas. However, findings must be interpreted with caution due to selected study limitations. One limitation is that several analyses relied on self-reported data such as data reported by instructors regarding program delivery and data reported by participants regarding frequency of home exercise practice. These self-report data may be biased due to social desirability. Another limitation is the small number of units of analysis involved in the study (i.e., 10 community-based organizations). Finally, it is important to mention that results regarding program reach and delivery as well as participation in the program could be biased positively toward the program since analyses involved data collected during a study about the program's effects. Instructors and participants were probably highly motivated because they were part of such a study. Future studies should examine if the program can be successfully implemented and maintained under varying conditions of support (financial, technical, and training) and in more heterogeneous community-based organizations in terms of geographical, cultural, and economic characteristics. Such studies are essential to understand what contextual factors contribute to or hinder program implementation and sustainability in community settings (Prohaska et al., 2006).

As shown in Table 1, other studies related to *Stand Up!* are currently part of the research team's agenda. These studies focus on examining the impact of the program on outcomes such as balance confidence, maintenance of involvement in physical activity, and reduction of falls incidence, as well as addressing issues of maintenance of the program's effects.

The future of *Stand Up !* in Quebec

In 2003, the Quebec Ministry of Health identified two types of strategies that should be promoted regarding falls prevention among seniors (Ministère de la Santé et des Services sociaux, 2003). To operationalize these strategies, an Advisory Committee was mandated with formulating recommendations to the Ministry of Health. These recommendations can be found in a recent publication available at www.msss.gouv.qc.ca (Direction générale de la santé publique, 2004). Among its recommendations, the Advisory Committee suggests that an intervention addressing multiple risks of falls such as *Stand Up!* should be offered by community-based organizations to independent-living seniors who are presenting some level of risk (e.g., seniors who have fallen in the previous year and/or seniors who are concerned by falls or their balance). In keeping with this recommendation, Quebec's National Institute of Public Health is currently working on the training of professionals to facilitate the implementation of *Stand Up!* across the province.

CONCLUSION

Recognizing the pivotal role of context in implementing health-related programs, the present investigation supports the idea that multifactorial falls prevention programs including exercise and educational components can be successfully offered in community-based settings. Furthermore, this paper exemplifies the fulfilment of recent recommendations that researchers should not only report results regarding program impact but should also provide evidence of program reach and delivery and of level of participation (Des Jarlais, Lyles, & Crepaz, 2004; Glasgow et al., 2003). Such information is essential to addressing the issue of feasibility of broader program implementation, to informing researchers about the generalizability of results, and to supporting "clinicians, health directors, and decision-makers responsible for selecting prevention and health promotion programs" (Glasgow et al., 2003; p. 1266).

REFERENCES

American College of Sports Medicine (2000). *ACSM's guidelines for exercise testing and prescription. 6th edition.* Philadelphia, PA: Lippincott, Williams & Wilkins.

Baloh, R.W., Fife, T.D., Zwerling, L., Socotch, T., Jacobson, K., Bell, T., & Beykirch, K. (1994). Comparison of static and dynamic posturography in young and older normal people. *Journal of the American Geriatrics Society, 42*(4): 405-412.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review, 84*: 191-215.

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

Bertakis, K.D., Azari, R., Helms, L.J., Callahan, E.J., & Robbins, J.A. (2000). Gender differences in the utilization of health care services. *Journal of Family Practice, 49*: 147-152.

Brauer, S., Burns, Y., & Galley, P. (1999). Lateral reach: A clinical measure of medio-lateral postural stability. *Physiotherapy Research International, 4*(2): 81-88.

Chang, J.T., Morton, S.C., Rubenstein, L.Z., Mojica, W.A., Maglione, M., Suttorp, M.J., Roth, E.A., & Shekelle, P.G. (2004). Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomized clinical trials. *British Medical Journal, 328*: 680.

Des Jarlais, D.C., Lyles, C., & Crepaz, N. (2004). Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. *American Journal of Public Health, 94*(3): 361-366.

Direction générale de la santé publique (2004). *La prévention des chutes dans un continuum de services. Cadre de référence*. Québec, QC : Ministère de la Santé et des Services sociaux.

Dishman, R.K. (1994). *Advances in exercise adherence*. Champaign, IL: Human Kinetics Publishers.

Duncan, P.W., Weiner, D.K., Chandler, J., & Studenski, S. (1990). Functional reach: A new clinical measure of balance. *Journals of Gerontology, 45*(6):M192-M197.

Duncan, P.W., Chandler, J., Studenski, S., Hughes, M., & Prescott, B. (1993). How do physiological components of balance affect mobility on elderly men? *Archives of Physical Medicine and Rehabilitation, 74*: 1343-1349.

Filiatrault, J., Robitaille, Y., Gauvin, L., Laforest, S., Fournier, M., Parisien, M., Corriveau, H., & Richard, L. (2006). Garder PIED sans augmenter sa peur de chuter ! *Canadian Journal of Occupational Therapy – Conference Program Supplement*, p. 43.

Franchignoni, F., Tesio, L., Martino, M.T., & Ricupero, C. (1998). Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. *Aging (Milano), 10*(1):26-31.

Gillespie, L.D., Gillespie, W.J., Robertson, M.C., Lamb, S.E., Cumming, R.G., & Rowe, B.H. (2003). Interventions for preventing falls in elderly people. *The Cochrane Database of Systematic Reviews, 4*: CD000340.

Glasgow, R.E., Lichtenstein, E., & Marcus, A.C. (2003). Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *American Journal of Public Health, 93*(8): 1261-1267.

Green, L., & Kreuter, M.W. (2005). *Health promotion planning. An educational and ecological approach.* (4th ed.) New York (NY): McGraw-Hill.

Institut national de santé publique du Québec (2006). *Portrait de santé du Québec et de ses régions 2006 : Deuxième rapport national sur l'état de santé de la population du Québec – Les statistiques.* Québec, QC: Gouvernement du Québec.

Jette, A.M., Harris, B.A., Sleeper, L., Lachman, M.E., Heislein, D., Giorgetti, M., & Levenson, C. (1996). A home-based exercise program for nondisabled older adults. *Journal of the American Geriatrics Society, 44*(6): 644-649.

Laforest, S., Pelletier, A., Gauvin, L., Fournier, M., Robitaille, Y., & Corriveau, H. (2006). Maintenance of Increased Involvement in Physical Activity among Older Adults Participating in a Community-Based Falls Prevention and Exercise Program. *Congress Program - International Congress on Physical Activity and Public Health, Atlanta,* p135.

Laforest, S., Pelletier, A., Gauvin, L., Robitaille, Y., Fournier, M., Corriveau, H., & Filiatrault, J. (Submitted). Impact of a community-based falls prevention programme on long-term maintenance of increased involvement in physical activity among older adults: A quasi-experimental design. Submitted for publication in *Journal of Aging and Health.*

Lord, S.R., & Castell, S. (1994). Physical Activity Program for Older Persons: Effects on Balance, Strength, Neuromuscular Control, and Reaction Time. *Archives of Physical Medicine and Rehabilitation, 75*: 648-52.

Marks, R., & Allegrante, J.P. (2004). Falls-prevention programs for older ambulatory community dwellers: From public health research to health promotion policy. *Social and Preventive Medicine, 49*: 171-178.

Ministère de la Santé et des Services sociaux (2003). *Quebec Public Health Program 2003-2012*. Québec, QC: Direction des communications, Ministère de la Santé et des Services sociaux.

Oakley, A., Dawson, M.F., Fullerton, D., Holland, J., Arnold, S., Cryer, C., Doyle, Y., Rice, J., & Hodgson, CR. (1996). Preventing falls and subsequent injury in older people. *Effective Health Care Bulletins, 2*(4): 1-16.

Prohaska, T., Belansky, E., Belza, B., Buchner, D., Marshall, V., McTigue, K., Satariano, W., & Wilcox, S. (2006). Physical activity, public health, and aging: Critical issues and research priorities. *Journal of Gerontology: Social Sciences, 61B*(5): S267-S273.

Public Health Agency of Canada (2005). *Inventory of falls prevention initiatives in Canada*. Ottawa, ON: Division of Aging and Seniors, Public Health Agency of Canada.

Robitaille, Y., Laforest, S., Fournier, M., Gauvin, L., Parisien, M., Corriveau, H., Trickey, F., & Damestoy, N. (2005). Moving forward in falls prevention: A plausibility study of the effectiveness of an exercise intervention to improve balance among older adults offered in real-world settings. *American Journal of Public Health, 95*(11): 2049-2056.

Rosenstock, I.M. (1990). The Health Belief Model: Explaining health behaviour through expectancies, in K. Glanz, F.M. Lewis, & B.K. Rimer (Eds). *Health behaviour and health education* (2nd ed.) (pp. 39-62). San Francisco: Jossey-Bass Publishers.

Sherwood, N.E., & Jeffery, R.W. (2000). The behavioural determinants of exercise: Implications for physical activity interventions. *Annual Review of Nutrition, 20*: 21-44.

Statistics Canada (2000). *Canadian Community Health Survey*. Ottawa, ON: Statistics Canada.

Topp, R., Mikesky, A., & Bawel, K. (1994). Developing a strength training program for older adults: Planning, programming, and potential outcomes. *Rehabilitation Nursing, 19*(5): 266-272.

Trickey, F., Parisien, M., Robitaille, Y., Gosselin, C., & Laforest, S. (1999). *Programme intégré d'équilibre dynamique – PIED. Guide d'animation.* Montréal, QC: Direction de la santé publique de Montréal, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Robitaille, Y., Laforest, S., Gosselin, C., & Parisien, M. (1999). *Évaluation du Programme intégré d'équilibre dynamique (P.I.E.D.) pour la prévention des chutes chez les aînés. Rapport détaillé.* Montréal, QC: Direction de santé publique de Montréal-Centre, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Robitaille, Y., Damestoy, N., Genest, C., Laforest, S., & Parisien, M. (2001). *Adoption naturelle du programme PIED de 1997 à 2001. Bilan et perspectives.* Montréal, QC: Direction de la santé publique de Montréal-Centre, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Parisien, M., Laforest, S., Genest, C., & Robitaille, Y. (2002). *Programme intégré d'équilibre dynamique – PIED. Guide d'animation.* Montréal, QC: Direction de santé publique de Montréal.

Trickey, F., Parisien, M., Laforest, S., Genest, C., & Robitaille, Y. (2003). *Stand Up! A fall prevention programme for seniors. Programme Guide*. Montreal, QC: Direction de santé publique de Montréal.

Victora, C.G., Habicht, J.-P., & Bryce, J. (2004). Evidence-based public health: Moving beyond randomized trials. *American Journal of Public Health, 94*(3): 400-405.

Ware, J.E., Snow, K.K., & Kosinski, M. (2000). *SF-36 Health Survey: Manual and Interpretation Guide*. Lincoln, RI: Quality Metric Incorporated.

Weatherall, M. (2004). Prevention of falls and fall-related fractures in community-dwelling older adults: A meta-analysis of estimates of effectiveness based on recent guidelines. *Internal Medicine Journal, 34*: 102-108.

Table 1. Major phases in *Stand Up!*'s development and evaluation

Methods	Phases	Goals	Results
Consultation of community groups and experts in rehabilitation and physical activity; Literature review; Analysis of available programs.	1995 Program conception	Develop a rigorous program, feasible within community-based organizations' context.	Publishing of the first edition of the program in French (named PIED) (Trickey, Parisien, Robitaille, Gosselin, & Laforest, 1999)
Quasi-experimental design (experimental: n = 27; control: n = 16).	1996 Pilot study	Assess program's potential for reducing risk factors.	Suggest positive impact of the program on participants' balance (Trickey, Robitaille, Laforest, Gosselin, & Parisien, 1999).
Interviews (n = 7); Phone survey (n = 51); Focus group (n = 21).	1997-2000 Follow-up of program's natural implementation	Get feedback from community-based organizations that adopted or were interested in adopting the program.	Identification of facilitators and barriers to implementation (Trickey, Robitaille, Damestoy, Genest, Laforest, & Parisien, 2001).
Consultation of experts and representatives from community-based organizations; Literature update.	2000-2002 Program re-engineering	Include recommendations provided by organizations to facilitate implementation; Update program content; Translate program from French to English.	Publishing of a new edition of the program (Trickey et al., 2002); Translation of the program and publishing of the English version (Trickey et al., 2003).
Quasi-experimental design; Measurements at pre-test, post-test, three and nine months post-test; 10 experimental organizations (n = 98); 7 control organizations (n = 102).	2002-to present Effectiveness study of the program when delivered under natural conditions of community-based organizations	Assess program's impact on participants' static balance, mobility, stability limits, and leg strength.	Positive impact of the program on static balance and mobility at the end of the program (Robitaille et al., 2005).
		Assess program's impact on maintenance of involvement in physical activity.	Positive impact of the program on two indicators of involvement in physical activity nine months after the program: variety of physical activities and energy expenditure (Laforest et al., 2006; Laforest et al., under review).
		Assess program's impact on balance confidence, perceived balance, and fear of falling.	Currently under investigation (Filiatrault et al., 2006).
		Assess program's impact on falls incidence.	Currently under investigation.

Table 2. Operationalization of training principles in the exercise components of *Stand Up!*

Training Principles	Operationalization in the Program
Training Volume	At least one home practice session (30 min.) is added to group exercise classes (2 X 60 min.) to ensure sufficient training volume on a weekly basis.
Specificity	Exercises designed to target the physiological components involved in balance and meet other program goals.
Overload	Exercises challenge balance and strength more than what is usually required in daily life (e.g., standing on one leg, standing on an unstable surface).
Gradation	The intensity of exercises is gradually increased, and conditions are of increasing complexity (e.g., eyes closed during unipodal exercise).
Personalization	Suggestions are provided in program guide to adapt exercises to each participant's capacities (e.g., exercising with or without support).
Minimize Adverse Effects	Instructors should monitor signs of fatigue and discomfort and ensure safety at all times. A co-leader is recommended for groups including more than 10 participants to ensure safe supervision.
Minimize Detraining	Home training continuation should be encouraged at the end of the program. A list of other available programs in the community should be provided to participants.
Maximize Participation	The instructor should phone absent participants after exercise classes. Leadership tips are provided in the program guide to make the program enjoyable and gratifying.

Table 3. Characteristics of participants at entry into *Stand Up!* (n = 98)

Characteristics	Mean (SD, range) or %
Sociodemographic Characteristics:	
Age	73.6 (7.4, 60-91)
Sex (female)	84 %
Living Conditions (live alone)	55 %
Education Level*:	
- Primary	29 %
- High School	42 %
- College/University	29 %
Perceived Health Status*:	
- Poor/Average	26 %
- Good/Very good	57 %
- Excellent	17 %
Criteria Defining Target Population:	
Falls (occurrence of one or several falls in the previous 12 months)	39 %
Near Falls (occurrence of one or several near falls in the previous 12 months)**	26 %
Fear of Falling:	
- Often/Very Often	26 %
- Occasionally	38 %
- Never	36 %
Perceived Balance (score on a 1 to 10-point rating scale)*:	
- Score < 5	13 %
- Score of 5, 6 or 7	52 %
- Score of 8, 9 or 10	35 %

* One missing observation for these variables (n = 97)
** Two missing observations for this variable (n = 96)
Note: Data for falls and near falls are not mutually exclusive.

Table 4. Number of community-based organizations meeting each program guideline

Program Guidelines	Number of Community-Based Organizations
Participant Recruitment and Selection	
- Use Several Recruitment Strategies*	10
- Use the Capacity-for-Exercise grid*	10
- Collect Medical Authorization Form when Required by the Capacity-for-Exercise grid*	7
Group Format	
- Group Size Not Exceeding 15*	10
- Co-Leader for Group Size Above 10*	None of the 6 groups over 10 used a co-leader
Leadership Background and Style	
- Group Led by Rehabilitation or Exercise Professionals*	10
- Dynamism and Humour**	10
- Positive Reinforcement**	10
Reliance on Program's Training Principles	
- Suggest Variations to Personalize Exercises**	10
- Gradually Increase Exercise Intensity *	9 (report doing it often)
- Phone Absent Participants to Maximize Attendance*	5 (report doing it often or always)
- Encourage Home Practice**	5
- Correct Participants' Position to Prevent Adverse Effects during Exercises with Therabands ® **	7

* Data Collected by Interview
** Data Collected by Observation of One Group Exercise Class

Table 5. Results of statistical tests comparing subgroups of participants on a series of characteristics

Variables	Attendance to Group Exercise Classes			Compliance to Home Exercise Module		
	Higher Attendance Mean (SD) or % (n = 71)	Lower Attendance Mean (SD) or % (n = 27)	p-value	Compliant Mean (SD) or % (n = 69)	Non Compliant Mean (SD) or % (n = 19)	p-value
Sociodemographic Characteristics:						
Age*	73.3 (7.6)	74.1 (7.0)	0.65	74.1 (7.4)	71.7 (7.0)	0.22
Sex (Female)**	82 %	89 %	0.39	86 %	74%	0.23
Education Level:**						
- Primary	24 %	42 %	0.11	29 %	26 %	0.81
- High School	42 %	42 %		42 %	37 %	
- College/University	34 %	15 %		29 %	37 %	
Perceived Health:**						
- Poor/Average	24 %	30 %	0.57	28 %	16 %	0.52
- Good/Very good	56 %	59 %		55 %	68 %	
- Excellent	20 %	11 %		17 %	16 %	
Fall-related variables:						
Falls/Near Falls (occurrence of one or several falls/near falls)**	58 %	48 %	0.39	59 %	53 %	0.60
Fear of Falling (often/very often)**	27 %	26 %	0.93	30 %	11 %	0.08

Table 5. Results of statistical tests comparing subgroups of participants on a series of characteristics (continued)

	Attendance to Group Exercise Classes			Compliance to Home Exercise Module		
Variables	Higher Attendance Mean (SD) or % (n = 71)	Lower Attendance Mean (SD) or % (n = 27)	p-value	Compliant Mean (SD) or % (n = 69)	Non Compliant Mean (SD) or % (n = 19)	p-value
Balance:						
Perceived Balance*	6.4 (1.9)	6.5 (2.1)	0.91	6.3 (2.0)	6.7 (1.8)	0.43
Static Balance Tests (s):						
- *One-Leg Stance (eyes open, R)**	15.6 (19.8)	10.8 (15.0)	0.20	12.6 (17.3)	24.5 (23.6)	**0.01**
- *One-Leg Stance (eyes open, L)**	12.9 (16.8)	6.7 (11.9)	**0.03**	10.1 (15.1)	19.4 (19.1)	**0.02**
- *One-Leg Stance (eyes closed, R)**	2.9 (2.0)	2.2 (1.6)	**0.05**	2.5 (1.7)	3.9 (2.5)	**0.01**
- *One-Leg Stance (eyes closed, L)**	3.0 (3.8)	2.0 (1.5)	**0.05**	2.8 (3.8)	2.9 (1.7)	0.46
- *Tandem Stance***	31.5 (23.9)	19.0 (23.0)	0.11	24.9 (22.8)	37.5 (24.9)	0.09
Stability Limits Tests (cm):						
- *Functional Reach**	25.3 (6.6)	21.9 (6.9)	**0.02**	24.1 (6.4)	27.1 (7.0)	0.07
- *Lateral Reach (R)**	15.1 (5.2)	14.6 (5.4)	0.68	14.6 (5.1)	17.9 (5.1)	**0.02**
- *Lateral Reach (L)**	14.6 (5.1)	13.0 (4.5)	0.16	13.7 (4.4)	17.2 (5.8)	**< 0.01**
Mobility Test (s):						
- *Tandem Walking**	17.0 (11.8)	16.0 (5.4)	0.96	17.6 (12.0)	14.5 (6.5)	0.37

* Comparison of subgroups based on Student t-tests
** Comparison of subgroups based on chi-square tests

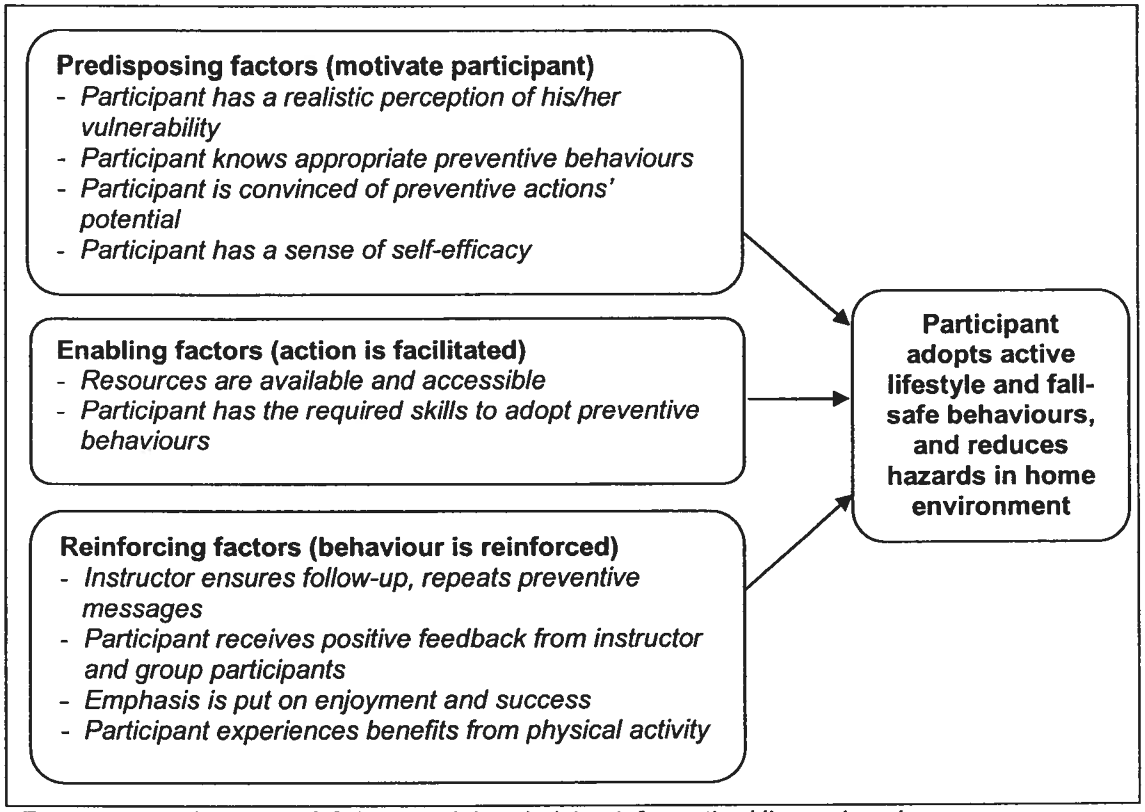


Figure 1. PRECEDE-PROCEED model underlying information/discussion classes

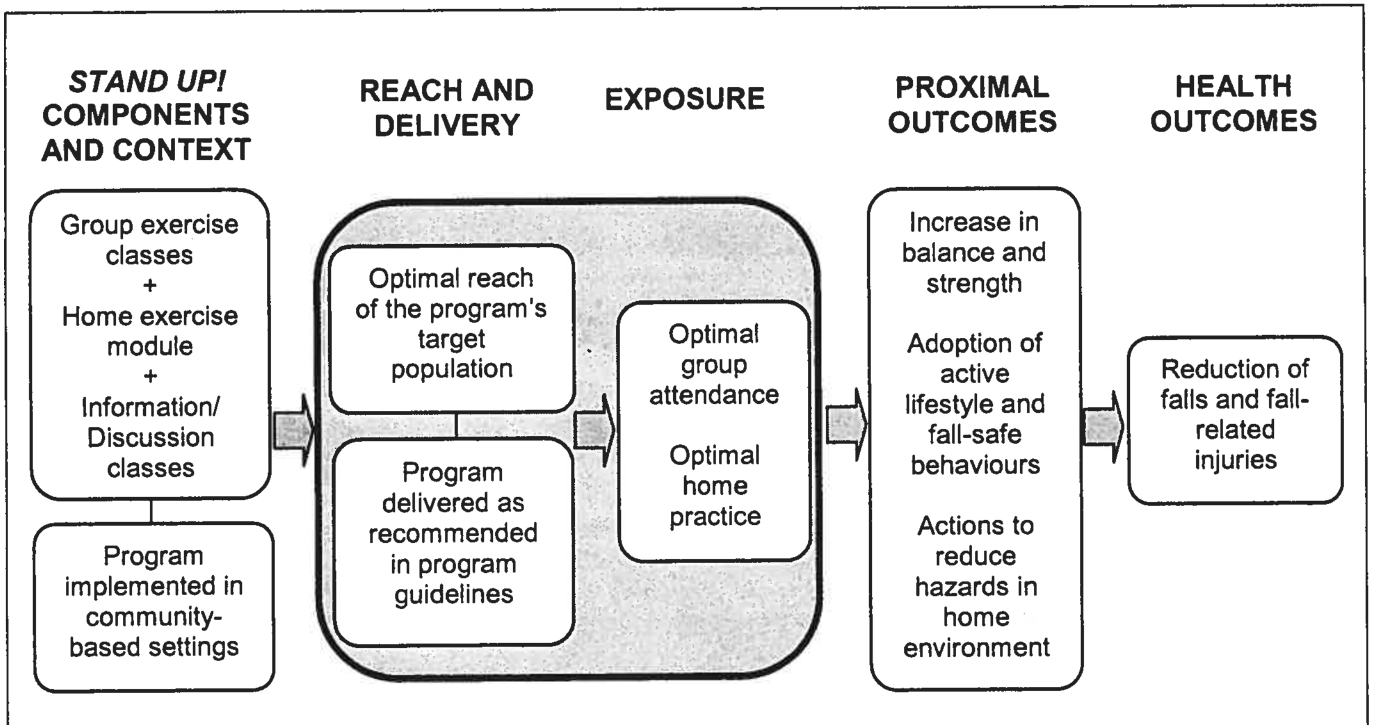


Figure 2. *Stand Up!*'s underlying logic model and emphasis of current paper

CHAPITRE 6 -

EVIDENCE OF THE PSYCHOMETRIC QUALITIES OF A SIMPLIFIED VERSION OF THE ACTIVITIES-SPECIFIC BALANCE CONFIDENCE SCALE FOR COMMUNITY-DWELLING SENIORS (ARTICLE 3)

Johanne Filiatrault, erg., M.Sc., doctorante

Lise Gauvin, Ph.D.

Michel Fournier, M.A.

Manon Parisien, erg., M.Sc.

Yvonne Robitaille, Ph.D.

Sophie Laforest, Ph.D.

Hélène Corriveau, pht., Ph.D.

Lucie Richard, Ph.D.

Article publié dans la revue *Archives of Physical Medicine and Rehabilitation*,

Volume 88, numéro 5, pages 664 à 672.

Contribution des auteurs

Titre de l'article:

Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors

Johanne Filiatrault était responsable de la recension des écrits, des analyses et de la rédaction de l'article.

Lise Gauvin a supervisé les analyses de l'étudiante et a collaboré à la rédaction.

Michel Fournier a fournit des conseils sur les analyses statistiques et a collaboré à la rédaction.

Manon Parisien, Yvonne Robitaille et Sophie Laforest étaient parmi les experts ayant traduit et modifié l'instrument de mesure et ont collaboré à la rédaction. Elles étaient aussi responsables de la collecte des données utilisées dans la présente étude.

Hélène Corriveau a collaboré à la rédaction.

Lucie Richard a soutenu l'étudiante dans sa démarche et a collaboré à la rédaction.

Accord des coauteurs et permission de l'éditeur

Johanne Filiatrault a obtenu l'accord des coauteurs et la permission de l'éditeur d'inclure l'article intitulé « Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors » dans cette thèse de doctorat (voir formulaires aux annexes 6 et 7).

Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors

Johanne Filiatrault, OT, MSc, Lise Gauvin, PhD,

Michel Fournier, MA, Manon Parisien, OT, MSc, Yvonne Robitaille, PhD,

Sophie Laforest, PhD, Hélène Corriveau, PT, PhD, Lucie Richard, PhD

From Institut national de santé publique du Québec, Montreal, QC, Canada (Filiatrault, Robitaille); Programme de doctorat en santé publique, Université de Montréal, Montreal, QC, Canada (Filiatrault); Groupe de recherche interdisciplinaire en santé, Montreal, QC, Canada (GRIS) (Filiatrault, Gauvin, Laforest, Richard); École de réadaptation, Université de Montréal, Montreal, QC, Canada (Filiatrault); Département de médecine sociale et préventive, Université de Montréal, Montreal, QC, Canada (Gauvin, Robitaille); Centre de recherche Léa-Roback sur les inégalités sociales de santé de Montréal, Montreal, QC, Canada (Gauvin, Richard); Direction de santé publique de Montréal, Montreal, QC, Canada (Fournier); Department of Epidemiology and Biostatistics, McGill University, Montreal, QC, Canada (Robitaille); Département de kinésiologie, Université de Montréal, Montreal, QC, Canada (Laforest); Centre de santé et de services sociaux Cavendish-Centre affilié universitaire en gérontologie sociale, Montreal, QC, Canada (Laforest); Département de médecine de famille, Université de

Sherbrooke, Sherbrooke, QC, Canada (Corriveau); Centre de recherche sur le vieillissement, Institut universitaire de gériatrie de Sherbrooke, Sherbrooke, QC, Canada (Corriveau); Faculté des sciences infirmières, Université de Montréal, Montreal, QC, Canada (Richard); Centre de recherche de l'Institut universitaire de gériatrie de Montréal, Montreal, QC, Canada (Richard).

Presented in part to the Conference of the Canadian Association of Occupational Therapists, May 27, 2005, Vancouver, BC, Canada.

Supported by the Canadian Institutes of Health Research (grant no. MOP 53123); the Regional Health and Social Services Boards of Montreal, Laval, and Montérégie, Qc, Canada; the Fonds de la recherche en santé du Québec (doctoral scholarship) and the Ordre des ergothérapeutes du Québec (doctoral scholarship).

Reprint requests to Johanne Filiatrault, O.T., M.Sc., Ph.D. Candidate, Clinical Adjunct Professor, Faculté de médecine, École de réadaptation, Université de Montréal, C.P. 6128, succursale Centre-ville, Montreal, QC, Canada, H3C 3J7; [redacted] : [redacted]

Short running head: Simplified version of the ABC Scale, Filiatrault

Key Words: Accidental falls; Accident prevention; Aged; Balance; Psychometrics; Rehabilitation.

ABSTRACT

Objective: To evaluate the validity, reliability, and item hierarchy of a modified version of the Activities-specific Balance Confidence (ABC) Scale using an item-response theory framework. Modifications to the scale aimed at increasing user-friendliness and promoting better congruence of the scale with public health falls prevention strategies.

Design: Cross-sectional study.

Setting: Community-based.

Participants: Two hundred community-dwelling seniors involved in an effectiveness study of a falls prevention program. Participants were recruited by community-based organizations.

Intervention: Not applicable.

Main Outcome Measure: Balance confidence.

Results: The modified ABC Scale (called ABC-Simplified [ABC-S] Scale) has high internal consistency (reliability index, .86) and good convergent validity (statistically significant associations with perceived balance; performances on the One-leg stance, Tandem stance and Tandem walking, Functional reach and Lateral reach [on the right side] tests; fear of falling; and occurrence of falls in the previous 12 months). Analyses also showed differing degrees of difficulty across items, allowing for a determination of the scale's item hierarchy.

Conclusions: The ABC-S Scale is a valid and reliable measure for the assessment of balance confidence among community-dwelling seniors. The fact that this measure was validated with high-functioning seniors makes it particularly well-suited for identifying community-dwelling seniors who are beginning to lose confidence in their balance and who could benefit from community falls prevention programs.

INTRODUCTION

Systematic reviews of the literature show that multifactorial programs and exercises are successful in reducing falls incidence and in improving balance among community-dwelling seniors.[1,2] Although falls and balance are important targets for intervention, other falls-related factors such as fear of falling, self-efficacy for avoiding falls, and balance confidence are also important ends and require increased attention in evaluative research as these factors can have an impact on seniors' quality of life.[3,4] Evidence also indicates that these variables are precursors of falls as they often lead to activity avoidance and subsequent physical deconditioning.[3,5,6] Despite the recent development of measures to assess these concepts, more psychometric research is required.[7] We aim to contribute to this development by further ascertaining the validity and reliability of a modified version of one of the most frequently used measures for assessing falls-related psychological factors, namely the Activities-specific Balance Confidence (ABC) Scale developed by Powell and Myers.[8]

The ABC Scale is one of the few scales that were developed jointly by clinicians and seniors.[7,8] Although often described as a measure of self-efficacy, the ABC Scale is framed as a balance confidence scale.[7] That is, it requires respondents to self-rate their degree of confidence in their balance associated with the performance of a series of daily living tasks. The ABC Scale is a questionnaire that includes 16 items representing basic daily living tasks (e.g., walking around the house, going up and down stairs) and more difficult tasks performed in the community (e.g., walking in a crowded shopping center, using an escalator).

Respondents provide ratings on a 0-to-100 % continuous scale based on the following cue question: "How confident are you that you will not lose your balance or become unsteady when you [list of items]". With its wide range of item difficulties, the ABC Scale seems well suited for assessing one psychological falls-related construct in populations presenting a diversity of levels of functioning, including high functioning community-dwelling seniors.[6,8]

Several studies support the psychometric qualities of the ABC Scale. An initial study of the psychometric properties of the ABC Scale with a sample of 60 community-dwelling seniors showed that the ABC Scale has high internal consistency (Cronbach α = .96) and high test-retest reliability (r = .92).[8] Results also showed that the ABC Scale has strong convergent validity reflected by a moderate to large correlation with the physical abilities subscale of the Physical Self-Efficacy Scale or PSES (r = .63), and a strong divergent validity based upon low and non significant correlations with an unrelated subscale (self-presentation) of the PSES (r = 0.03) and another unrelated scale called the Positive and Negative Affect Schedule (r = .12). The ABC Scale also showed power to discriminate between high versus low mobility seniors. Several other studies have confirmed the scale's reliability and validity with seniors (see Jørstad et al [7]). In addition, the ABC Scale was adapted for seniors living in the United Kingdom to accommodate for differences between American-English and British-English.[9] A psychometric study of the British version also revealed high internal consistency and good test-retest reliability of the scale. Recently, a Dutch version of the scale (the ABC-NL) showed satisfactory psychometric qualities among community-dwelling seniors.[10] A Chinese version of the scale (the ABC-C) tested for reliability among a sample of Chinese immigrants aged over 50 years living in Vancouver, BC, Canada, was also found to be reliable.[11]

The ABC Scale's psychometric properties have also been studied among people presenting with specific medical conditions. A study conducted among people with lower limb amputation supported the scale's internal consistency, test-retest reliability, and convergent validity.[12] There is also evidence that the ABC Scale is a valid measure for use with people presenting with a vestibular dysfunction and with older adults who sustained a stroke.[13,14] More recently, similar findings were obtained among persons who had sustained a stroke and who responded to either the original version or a French-Canadian version of the ABC Scale.[15]

Despite its psychometric qualities, the ABC Scale could benefit from some improvements in terms of user-friendliness. Indeed, seniors have shown problems interpreting the cue question and using the response format of the scale. That is, the ABC Scale's cue question is framed in an avoidance rather than action perspective (i.e., losing balance as opposed to maintaining balance) which appears somewhat incongruent with the positive focus of balance confidence.

Thus, one modification that could improve the scale consists of modifying the cue question from "How confident are you that you *will not lose* your balance or become unsteady when you..." to "Up to what point are you confident that you *will maintain* your balance when you do the following activities?".[1]

In addition, the scale's response format, which requires participants to rate their balance confidence on a continuous scale ranging from 0% to 100 %, is sometimes problematic, because seniors demonstrate difficulty in grasping the full range of the scale. Others have reported similar problems with a 0%-to-100 % response format, especially among seniors with limited educational background.[17] It must be noted that in a recent publication, Myers replaced the 0%-to-100 % continuous response scale with an 11-point response scale that includes 10% anchor increments (0%, 10%, ..., 100%).[16] Although this new response format is simpler than the original response format, the scale might remain problematic for selected subgroups of seniors who have reported difficulties with a 10-point scale.[17,18] Therefore, another modification that could improve the user-friendliness of the ABC Scale consists of modifying the 0%-to-100% response format to a 4-category response format with descriptive anchors (i.e., 0, not at all confident; 1, slightly confident; 2, moderately confident; and 3, very confident).

Furthermore, one item of the ABC Scale (i.e., walk on icy sidewalks) appears problematic from a public health perspective. Indeed, walking outside

---

[1] With respect to this point, we note that the "will not lose your balance or become unsteady" question was used in the original psychometric work published by Powell and Myers[8] and in other studies published by Myers and her team[6], but that in a more recent publication, Myers presents the scale with the "can maintain your balance and remain steady" question.[16] To our knowledge, there are no psychometric data pertaining to the "can maintain your balance and remain steady" question.

when sidewalks and roads are icy is a particularly hazardous task for seniors. This is supported by empirical data showing that slipping on ice is among the main factors contributing to the excess seasonal risk of hip, arm, and other fractures among seniors.[19] Many seniors intuitively tend to avoid walking outside when weather conditions are bad. Therefore, questioning seniors about this hazardous task is somewhat irrelevant and conveys a message that is rather incongruent with public health falls prevention strategies. Indeed, avoiding walking on icy sidewalks is a protective behavior that should be reinforced by public health interventions directed at community-dwelling seniors. Therefore, removing this item from the scale is considered an improvement from a public health standpoint. In sum, the resulting version of the scale (designated as the ABC-Simplified [ABC-S]) contains 15 items rather than 16 and has more user-friendly cue question and response format.

Finally, previous psychometric studies of the scale were based on classical test theory methods which are ill-suited for scales using categorical response formats. Given the proposed amendments to the response format of the ABC Scale, item-response theory (IRT) methods were used to study the scale's properties. More specifically, a polytomous IRT model known as the Samejima graded response model is appropriate in situations in which the objective is to measure a latent construct through responses to items that are scored with an ordered-category rating scale.[20] Such a model is based on the assumption that the response to an item is not only a function of the psychological characteristic of the person (or latent trait) but is also a function of the level of difficulty of the item.

Thus, the purpose of this study was to examine the psychometric properties of a simplified version of the ABC Scale (the ABC-S Scale) using an IRT framework. More specifically, we tested the scale's internal consistency, item hierarchy, and convergent validity with perceived balance, balance performance, fear of falling and occurrence of falls in the previous 12 months using a polytomous IRT model.

METHODS

Design and Participants

The initial sample included 200 community-dwelling seniors living in the Montreal area who were recruited by community-based organizations to participate in an effectiveness study of a falls prevention program (called *Stand Up!*) on the balance of participants.[21] For inclusion in the intervention study, participants had to meet the following criteria: 1) be aged 60 years or over; 2) be community dwellers; 3) be exempt from disabling conditions (e.g., Parkinson disease, multiple sclerosis) and have the required capacities to get involved in a group exercise program as assessed by a preselection grid developed for the program; 4) be exempt from cognitive deficits; and 5) be able to speak either English or French. Cognitive integrity was assessed by interviewers responsible for administering the modified ABC Scale. Interviewers were instructed to use an additional questionnaire, the *Short Portable Mental Status Questionnaire,*[22] whenever they suspected cognitive deficits in participants. In the end, none of the participants required further assessment. In addition, recruitment was publicized as a search for people with one or several of the following characteristics: 1) having fallen once or several times in the previous 12 months; 2) being afraid of falling; or 3) expressing a concern about balance. Baseline data collected for the effectiveness study were used for the present investigation.

Data Collection Procedures

Each participant was scheduled for a 2-hour assessment session that took place in their residential neighborhoods. All variables included in this study, except balance performance, were assessed during face-to-face interviews. Balance performance was assessed by physical therapists using a battery of standardized tests. To minimize measurement errors, all interviewers (n = 7) and physical therapists (n = 16) received formal training before data collection. They were also blinded to participants' group assignment in the context of the effectiveness study.

Measures

Demographic Characteristics.- Demographic data included age, sex, education level, and perception of personal economic conditions. Except for sex, demographic variables were transformed into three categories variables. There was one missing observation regarding one participant's education level. Instead of discarding that participant from the present study sample, the average education level was imputed to this person.

Balance Confidence.- As mentioned previously, a simplified version of the ABC Scale was administered to participants to assess their levels of balance confidence. Each participant was asked to rate his/her confidence in his/her ability to maintain balance ("Up to what point are you confident that you will maintain your balance when you do the following activities?") in performing 15 tasks of daily living by choosing one of the following four response options: not at all confident, slightly confident, moderately confident, or very confident. Given that a majority of study participants listed French as their main language and the fact that there were no available French-Canadian versions of the ABC Scale at the time of the study, the cue question and items were also translated into French. The modified ABC Scale was translated by five native French-speaking experts (rehabilitation and physical activity professionals and researchers) involved in the field of falls prevention who were fluently bilingual (French and English). After translation of the measure by each expert, the five versions were compared and team consensus was used to resolve minor discrepancies. Because consensus was readily achieved and given that the items of the scale represent tasks of daily living rather then nuances about thoughts and feelings, further efforts at cross-validation of translations were deemed superfluous. Minor changes in word usage were also made to adapt to the cultural uniqueness of the use of the French and English languages in Quebec (e.g., expression "shopping center" rather than "mall" in the English version). This procedure was analogous to that reported by other researchers using the ABC Scale in the United Kingdom [9] and more recently in Canada.[15]

Perceived Balance.- Each participant's overall perception of his/her balance was assessed with a Likert-type rating scale with anchors ranging from 1 to 10 with descriptive labels (i.e., poor balance, moderate balance, excellent balance) and a single question: "Using the following scale, show me how good you think your balance is". Perceived balance scores were transformed into dummy variables through a tertile split for subsequent statistical analysis.

Balance Performance.- Balance performance tests included the One-leg stance[23], the Tandem stance[24], the Tandem walking[25], the Functional reach[26], and the Lateral reach[27] tests. All these tests have shown good reliability and validity.[28,29] The One-leg stance test measured the amount of time a participant could stand on one foot without losing balance. Even though a maximum of 30 seconds has been suggested when completing this test with seniors[30], we opted for a 60- second ceiling because of the high level of functioning of participants. The test was performed while standing on each foot, as well as with and without sight. The Tandem stance test measured the amount of time a participant could stand in a tandem position (heel-to-toe position) without losing balance. The maximum time was set at 60 seconds. Tandem walking assessed participants' dynamic balance with a narrow support base (heel-to-toe walking). Participants had to walk along a marked line on the floor as fast as possible for a distance of three meters. The amount of time taken to walk this distance was measured in seconds. The Functional reach test provided a measure of stability during a self-initiated forward movement of the upper extremities. It consisted of measuring the difference between a person's arms length and maximal forward reach when the shoulders were flexed at a 90° angle using a meter stick attached to the wall at shoulder height. Each person had to maintain a fixed base of support during this test. The procedure for the Lateral reach test was similar, except that the self-initiated movement was performed laterally. It consisted of measuring the distance between a participant's arm length and maximal lateral reach. This test was performed on each side of the body. Each balance performance test was administered twice, and the best performance score was kept for analysis. Balance performance scores were also transformed into dummy variables through a tertile split.

Fear of Falling and Falls Occurrence.- Fear of falling was assessed using a single question - "Are you afraid of falling ?" - and 4-level response format (very often, often, occasionally, never). Participants who declared that they were never or occasionally afraid of falling were grouped in the nonfearful category, whereas participants who reported that they were often or very often afraid of falling were grouped in the fearful category. The number of falls experienced by each participant in the previous 12 months was also recorded. Data were dichotomized for analysis (0, no fall; 1, one fall or more).

Health problems related to falls.- Participants had to indicate whether they suffered from a series of health problems related to falls such as dizziness, visual problems (e.g., cataract, glaucoma), and urinary incontinence. A dummy variable was created for use as a control variable indicating the presence or absence of such problems (0, no problem; 1, one problem or more).

Data Analysis

Descriptive statistics for each variable were produced to create a profile of the study sample. Distributions of responses to each item on the ABC-S Scale were also examined. Next, we performed a series of analyses to examine the scale's psychometric properties, namely the scale's internal consistency, item hierarchy, and convergent validity. These analyses were conducted using multilevel modeling methods for polytomous outcomes. Multilevel modeling methods are especially adapted to data that have a nested structure.[31] In the present case, ordinal responses to the 15 items of the ABC-S Scale were viewed as level 1 observations nested within people (level 2 observations).

The multilevel modeling analysis proceeded in four steps. First, a simple model (called the null model) that included only each person's response to each item of the scale and only one random effect on the intercept was tested. This model allowed for determining whether there was significant between-person variability in overall balance confidence (i.e., latent construct of balance confidence). Second, dummy variables were created to differentiate 14 of the 15 items and were entered simultaneously into the model as level 1 predictors. The second item on the scale (going up and down stairs) was chosen as the reference category, because it was thought to represent a standard for independent mobility among community-dwelling seniors. Coefficients associated with dummy variables representing the other 14 items allowed for computation of an estimate of a reliability index reflecting the scale's internal consistency (for more details about the reliability index used in multilevel modeling, see description by Raudenbush and Bryk[31], p. 46-66). These coefficients also allowed for establishing the item hierarchy in the scale.

As a third step, a multilevel model that included age, sex, education level, and perception of personal economic conditions as control variables was tested.

This was done by entering dummy variables associated with each control variable into the model as level 2 variables modifying the intercept. As a final step, multilevel models that included dummy variables related to either (1) perceived balance, (2) balance performance measures, (3) fear of falling, or (4) occurrence of falls in the previous 12 months were tested. Again, dummy variables representing each of these variables were entered as level 2 variables modifying the intercept. This last step allowed for an examination of the associations between each of these variables and the latent construct of balance confidence and therefore tested the convergent validity of the measure. The multilevel modeling method used for data analysis has the benefit of maximizing datasets. More precisely, when a level 1 observation is missing, (e.g. a person does not provide an answer on one item of the scale), no listwise deletion of the case occurs. Rather, data from all answers provided by that participant are used in estimating a final model through empirical Bayes estimation procedures. However, if a level 2 observation is missing (e.g., score on a balance performance test), the case is discarded from the analysis. The issue of maximizing datasets justified the choice of building separate models to establish the scale's convergent validity. The equations in appendix 1 provide an example of the final multilevel models tested. As can be seen, the equations are consistent with a polytomous IRT model and more specifically with the Samejima graded response model, which involves cumulative probabilities.[20]

A final set of ancillary analyses were performed to examine the potentially confounding role of health problems related to falls (e.g., dizziness, visual problems, urinary incontinence). We re-ran all final models adding a dummy variable contrasting participants with falls-related health problems to those without such problems. A parallel procedure was performed to control for language of the administration of the questionnaire. All multilevel analyses were preformed with HLM 6.0 software (see www.ssicentral.com).

RESULTS

Participant Characteristics

Among the 200 participants, one could not complete the ABC-S Scale because of a communication problem (slight expressive aphasia). Data for two other participants were excluded from the analyses because the interviewers expressed serious concerns about the quality of responses. That is, one participant completed the interview in a rush and another participant was interviewed at the end of the day and appeared very tired. Most questionnaires (88 %) were administered in French.

Table 1 provides information on the demographics, perceived balance, balance performance, and other falls-related characteristics of the participants. Overall, the sample was composed of people in their midseventies, mainly women, with varied education levels and with average financial means. On average, participants perceived their balance as somewhat higher than the midpoint on a scale from 1 to 10. Table 1 also highlights some heterogeneity in the sample in terms of balance performance reflected by large standard deviation values obtained for balance performance tests. More than one third of participants were considered fearful (i.e., being often or very often afraid of falling), and 38 % of participants reported having fallen once or on several occasions in the previous 12 months.

[Insert Table 1 here]

Between-Subject Variability and Reliability Analysis

The first step of the multilevel analysis (i.e., testing the null model) indicated that there was significant variability between participants in terms of overall responses to items as reflected by a statistically significant variance component (χ^2_{196} test = 1175.3, p < .001). The reliability index (equivalent to the Cronbach α) computed after inclusion of dummy variables distinguishing scale items was .86.

Distribution of Responses to Items of the Modified Scale and Item Hierarchy

Table 2 outlines observed responses for each item of the modified scale and the item hierarchy as a function of ascending difficulty. This hierarchy was established from multilevel analysis by examining regression coefficients. For illustrative purposes, we computed predicted probabilities for each item.

Examination of observed responses on each item of the scale showed highly skewed distributions for most items. As expected from a high-functioning sample, this skewness was toward the more confident side of the scale. The item hierarchy showed that the easiest items included “sweeping the floor” and “going out of the house to get to a car parked in the driveway”, whereas the most difficult items were “getting up on a chair to get an object” and “using an escalator without being able to hold the ramp”.

[Insert Table 2 here]

Convergent Validity Analysis

Table 3 presents results obtained for all multilevel models testing associations between the latent construct of balance confidence and perceived balance, balance performance, fear of falling, and occurrence of falls in the previous 12 months. The right column of the table provides the proportion of between subject variance accounted for by the addition of each set of variables to the multilevel model after adjustment for age, sex, education level, and perception of personal economic conditions. With the exception of Lateral reach performed on the left side, table 3 indicates that all odds ratios associated with dummy variables representing high and moderate levels of perceived balance and balance performance were statistically significant. This means that people in the highest and middle tertiles of scores on perceived balance and balance performance had higher balance confidence scores compared with people in the lowest tertile of scores on perceived balance and balance performance.

In addition, results in table 3 also indicate that fear of falling and occurrence of falls in the previous 12 months were significantly associated with balance confidence. Seniors presenting low levels of fear had higher balance confidence scores in comparison to those with high levels of fear. Similarly, seniors with no history of falls in the previous 12 months had higher balance confidence scores in comparison to those who had fallen during this period. Finally, examination of the percentage of between-subjects variance explained by each variable in the analysis showed that perceived balance and fear of falling were the variables that explained the largest proportion of level 2 variance in models (27 %). As indicated in table 3, there were a few missing observations in some of the multilevel models.

However, these missing data represented less then 5 % of observations for all level 2 variables tested, with the exception of Tandem walking performance.

[Insert Table 3 here]

Ancillary Analyses

Ancillary analyses taking into account health problems related to falls did not influence the findings. Similarly, findings remained unchanged when models included a dummy variable reflecting language of administration of the questionnaire (English or French). Therefore, we chose to present only the results of more parsimonious models.

Global Balance Confidence Score

In an effort to maximize the utility of the ABC-S Scale for practitioners, we explored the relevance of a simple and readily accessible method of computing an overall balance confidence score. Thus, we examined the correlation between participants' estimates of balance confidence as computed with the Samejima graded response model and scores obtained by summing item responses (0, 1, 2, or 3). A large and significant correlation ($r = .94$; $p < .001$) was obtained, thus supporting the cogency of using a simple summing of responses to the 15 items as an indicator of global balance confidence.

DISCUSSION

The purpose of this study was to examine the psychometric properties of a modified version of the ABC Scale, the ABC-S Scale, through application of IRT methods and multilevel modeling techniques. The proposed amendments to the scale include simplifying the cue question and response format to improve the scale's user-friendliness with seniors and removing the last item of the original scale (walk on icy sidewalks) to insure congruence of the scale with public health falls prevention strategies.

The results of this study indicate that the ABC-S Scale has good internal consistency with a reliability index (equivalent to Cronbach α) of .86. This value appears somewhat smaller then Cronbach α coefficients reported in previous psychometric studies. However, if these Cronbach α coefficients are recast into a 4-level scale instead of a 101-level scale[32] using a variant of the Spearman-Brown prophecy formula, we obtain values that are similar to the reliability index obtained in this study (e.g., a Cronbach α of .96 is equivalent to .83). Furthermore, it should be noted that compared with the traditional classical test theory framework, the IRT framework used in this study has the advantage of providing an estimate of a scale's internal consistency in a given population that is independent of the sample.[33]

This study also allowed for a determination of the difficulty level of each item and for the establishment of an item hierarchy. "Sweeping the floor" is the item with the highest probability of being very confident (see table 2). The multilevel model also suggests that "using an escalator without being able to hold the ramp" is the most difficult item in terms of balance with the lowest probability of a very confident response. It is interesting to note that in their initial psychometric study, Powell and Myers[8] ordered the items of the ABC Scale according to mean level of confidence obtained across study participants. Although some similarities were observed between the present item hierarchy and the ranking obtained by Powell and Myers, there are some discrepancies. In their study, the "reach at eye level" item obtained the highest mean level of confidence, whereas in the present study, "sweeping the floor" was estimated to be the easiest item in terms of balance confidence. This highlights the fact that item hierarchy should be established by considering two separate sources of variability: variability related to people and variability related to items.

Although the analysis of the item hierarchy showed differing degrees of difficulty across items, it also showed that for only two of the 15 items (i.e., items 6 and 15), less than half of the sample indicated that they were not very confident in their ability to maintain balance. This finding underscores the need for identification of other tasks of daily living that might be viewed as more difficult in terms of balance by high functioning seniors and might allow for early detection of balance risk in the context of preventive interventions.

Results of this study also provide evidence of the convergent validity of the scale. Indeed, results indicated that seniors with higher and moderate levels of perceived balance or with higher and moderate balance performance scores (except for left Lateral reach performance) had significantly higher balance confidence compared with seniors with lower levels of perceived balance or with lower balance performance scores. These results support the convergent validity of the scale. Examination of associations between fear of falling or occurrence of falls in the previous 12 months and balance confidence also supports the convergent validity of the scale. The fact that perceived balance and fear of falling explained a larger proportion of variance in balance confidence than actual balance performance is not surprising. Indeed, perceived balance, fear of falling, and balance confidence are three psychological falls-related concepts. It is likely that a person's balance confidence related to task performance depends on the person's overall subjective appreciation of his/her balance. Other data also show that balance confidence and fear of falling are closely related constructs.[8] Finally, the results of this study support the cogency of using a global balance confidence score computed by the simple addition of scores obtained on the 15 items of the scale.

This study also opens the door to a new set of investigations into the impact of falls prevention interventions. That is, given that balance confidence and actual balance are so strongly associated, a relevant question is to examine how balance confidence is influenced by intervention efforts designed toward improving actual balance or by decline in balance due to the normal aging process or health problems. Identifying how and when balance confidence changes offers the possibility of improving interventions to include balance confidence either as an intermediary target of intervention or as a valued outcome of intervention for improving quality of life.

Study Strengths and Limitations

This study provides evidence in support of the validity and reliability of a balance confidence scale that could be useful to interventionists working toward falls prevention in community-dwelling seniors. Modifications brought to the cue question and response format of the original ABC Scale aimed at rendering this measure more user-friendly to community-dwelling seniors. Also, removal of one item of the original scale (walk on icy sidewalks) aimed at promoting a better congruence with public health falls prevention strategies. Finally, the IRT framework used in this investigation allowed for establishing the scale's item hierarchy. This hierarchy could be helpful in guiding interventions. However, investigations of the sensitivity of this measure to change in balance confidence following interventions are needed.

Despite these strengths, results of this study must be interpreted in light of some limitations. Although the sample size was large enough to test psychometric properties of this simplified version of the ABC Scale and to detect relevant associations, it was relatively small in the context of population research. Future research aimed at replicating and extending the current findings is warranted. In addition, the sample of this investigation included high-functioning seniors who volunteered for a falls prevention intervention and who had experienced falls in the previous year or were concerned about their balance. Further investigations into the generalizability of the current findings with other subpopulations such as community-dwelling seniors receiving home care services or high functioning seniors who do not volunteer for falls prevention interventions are certainly warranted.

CONCLUSION

This study responds to a need to better establish the psychometric properties of available measures for the assessment of psychological constructs related to falls.[7] This study provides evidence in support of the validity and internal consistency of a modified, more user-friendly version of the ABC Scale. Its psychometric qualities, its simplicity, the fact that it can be rapidly administered, and its high correlation with overall scores produced through IRT and multilevel methods render this scale useful for interventionists who are interested in assessing psychological factors related to falls without unduly increasing respondents burden. The fact that the ABC-S Scale was validated with high-functioning seniors renders this measure particularly well suited for the detection of community-dwelling seniors who are beginning to present risks and who could benefit from community-based falls prevention interventions. The ABC-S Scale also has high potential for assessing the effect of community-based falls prevention programs on one psychological falls-related factor, namely balance confidence associated with daily living tasks. In keeping with other parallel initiatives regarding another psychological falls-related measure[34], we believe that research and intervention in falls prevention will be accelerated through the availability of psychometrically valid yet user-friendly measurement instruments.

ACKNOWLEDGMENTS

We thank Céline Gosselin, MA, and Francine Trickey, MSc, from the Direction de santé publique de Montréal for their contribution to the scale's modification and translation into French.

[Insert Appendix 1 here]

REFERENCES

1. Barnett A, Smith B, Lord SR, Williams M, Baumand A. Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial. Age Ageing 2003;32:407-14.
2. Gillespie LD, Gillespie WJ, Robertson MC, Lamb SE, Cumming RG, Rowe BH. Interventions for preventing falls in elderly people. Cochrane Database Syst Rev 2003;(4): CD000340.
3. Cumming RG, Salkeld G, Thomas M, Szonyi, G. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. J Gerontol A Biol Sci Med Sci 2000;55:M299-305.
4. Li F, Fisher KJ, Harmer P, McAuley E, Wilson NL. Fear of falling in elderly persons: association with falls, functional ability, and quality of life. J Gerontol B Psychol Sci Soc Sci 2003;58:P283-90.
5. Friedman S, Munoz B, West SK, Rubin GS, Fried LP. Falls and fear of falling: which comes first ? A longitudinal prediction model suggests strategies for primary and secondary prevention. J Am Geriatr Soc 2002;50:1329-35.
6. Myers AM, Fletcher PC, Myers AH, Sherk W. Discriminative and evaluative properties of the Activities-specific Balance Confidence (ABC) Scale. J Gerontol A Biol Sci Med Sci 1998;53A:M287-94.
7. Jørstad EC, Hauer K, Becker C, Lamb SE. Measuring the psychological outcomes of falling: A systematic review. J Am Geriatr Soc 2005;53:501-510.
8. Powell LE, Myers AM. The Activities-specific Balance Confidence (ABC) Scale. J Gerontol A Biol Sci Med Sci 1995; 50A:M28-34.

9. Parry SW, Steen N, Galloway SR, Kenny RA, Bond J. Falls and confidence related quality of life outcome measures in an older British cohort. Postgrad Med J 2001;77:103-8.

10. van Heuvelen MJ, Horchstenbach J, de Greef J, Brouwer WH, Mulder T, Scherder E. Is the Activities-specific Balance Confidence Scale suitable for Dutch older persons living in the community ? [Article in Dutch] Tijdschrift voor Gerontologie en Geriatrie 2005;36(4):146-54.

11. Hsu P, Miller WC. Reliability of the Chinese version of the Activities-specific Balance Confidence Scale. Disabil Rehabil 2006;28(20):1287-92.

12. Miller WC, Deathe AB, Speechley M. Psychometric properties of the Activities-specific Balance Confidence Scale among individuals with a lower-limb amputation. Arch Phys Med Rehabil, 2003;84:656-61.

13. Whitney SL, Hudak MT, Marchetti GF. The Activities-specific Balance Confidence Scale and the Dizziness Handicap Inventory: A comparison. J Vestib Res, 1999;9:253-9.

14. Botner EM, Miller WC, Eng JJ. Measurement properties of the Activities-specific Balance Confidence Scale among individuals with stroke. Disabil Rehabil 2005;27(4):156-63.

15. Salbach NM, Mayo NE, Hanley JA, Richards CL, Wood-Dauphinee S. Psychometric evaluation of the original and Canadian French version of the Activities-specific Balance Confidence Scale among people with stroke. Arch Phys Med Rehabil, 2006; 87:1597-1604.

16. Myers AM. Program evaluation for exercise leaders. Waterloo, ON: Human Kinetics;1999.

17. Lachman ME, Howland J, Tennstedt S, Jette A, Assmann S, Peterson EW. Fear of falling and activity restriction: The Survey of Activities and Fear of Falling in the Elderly (SAFE). J Gerontol B Psychol Sci Soc Sci 1998;53B:P43-50.

18. Buchner DM, Hornbrook MC, Kutner NG, Tinetti ME, Ory MG, Mulrow CD, et al. Development of the Common Data Base for the FICSIT trials. J Am Geriatr Soc 1993;41:297-308.

19. Bulajic-Kopjar M. Seasonal variations in incidence of fractures among elderly people. Inj Prev 2006;6:16-9.

20. DeBoeck P, Wilson, M. Explanatory item response models: A generalized linear and nonlinear approach. New York: Springer; 2004.

21. Robitaille Y, Laforest S, Fournier M, Gauvin L, Parisien M, Corriveau H, Trickey F, Damestoy N. Moving forward in fall prevention: An intervention to improve balance among older adults in real-world settings. Am J Pub Health, 2005;95:2049-56.

22. Pfeiffer E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. J Am Geriatr Soc 1975;23:433-41.

23. Gehlson GM, Whaley MH. Falls in the elderly: Part II – Balance, strength and flexibility. Arch Phys Med Rehabil 1990;71:739-41.

24. Heitman DK, Gossman MR, Shaddeau SA, Jackson JR. Balance performance and step width in non institutionalized elderly female fallers and non fallers. Phys Ther 1989;69:923-31.

25. Baloh RW, Fife TD, Zwerling L, Socotch T, Jacobson K, Bell T, Beykirch K. Comparison of static and dynamic posturography in young and older normal people. J Am Geriatr Soc 1994;42:405-12.

26. Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. J Gerontol A Biol Sci Med Sci 1990;45:M192-7.

27. Brauer S, Burns Y, Galley P. Lateral reach: a clinical measure of medio-lateral postural stability. Physiother Res Intern 1999;4:81-8.

28. Franchignoni F, Tesio L, Martino MT, Ricupero C. Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. Aging Clin Experim Res 1998:10:26-31.

29. MacKight C, Rockwood K. Assessing mobility in elderly people. A review of performance-based measures of balance, gait and mobility for bedside use. Rev Clin Gerontol 1995;5:464-86.

30. Berg KO, Wood-Dauphinee SL, Williams JI, Gayton D. Measuring balance in the elderly: Preliminary development of an instrument. Physiother Can 1989;41:304-11.

31. Raudenbush SW, Bryk AS. Hierarchical Linear Models. Applications and data analysis methods. 2nd ed. Thousand Oaks: Sage Publications; 2002.

32. Masters JR. Relationship between number of response categories and reliability of Likert-type questionnaires. J Educ Meas, 1974;11:49-53.

33. Mâsse LC, Dassa C, Gauvin L, Giles-Corti B, Motl R. Emerging measurement and statistical methods in physical activity research. Am J Prev Med 2002;23:44-55.

34. Yardley L, Beyer N, Hauer K, Kempen G, Piot-Ziegler C, Todd C. Development and initial validation of the Falls Efficacy Scale-International (FES-I). Age Ageing 2005;34:614-9.

Table 1. Characteristics of Study Participants

Characteristics	Mean ± SD or %
Demographics (n = 197)	
Age (y)	73.9 ± 7.4
Sex (female)	84
Education level	
Primary	25
High school	43
College/university	32
Perception of personal economic conditions	
Very poor	0
Poor	7.6
Average	67.5
Well off	24.9
Perceived balance (n = 197)	6.4 ± 2.1
Balance performance measures	
Static balance and mobility scores (s)	
One-leg stance, eyes open, right side (n = 197)	13.2 ± 16.8
One-leg stance, eyes open (n = 195)	11.8 ± 15.9
One-leg stance, eyes closed, right side (n = 196)	2.6 ± 2.1
One-leg stance, eyes closed, left side (n = 193)	2.6 ± 2.8
Tandem stance (n = 196)	28.0 ± 24.1
Tandem walking (n = 180)	17.4 ± 10.2
Stability limits (cm)	
- Functional reach (n = 192)	24.6 ± 6.7
- Lateral reach, right side (n = 188)	14.2 ± 4.7
- Lateral reach, left side (n = 188)	13.5 ± 4.6
Fear of falling (fearful) (n = 197)	32.5
Falls occurrence in the previous 12 months (n = 197)	
None	62
One fall	23
Two or more falls	15

Abbreviation: SD, standard deviation.

Table 2. Proportion of Observed and Predicted Responses in Each Response Category for Each Item of the ABC-S Scale

Items in Ascending Order of Difficulty (number of observations)	Observed % of Responses in Each Category (predicted %)*				
	Very confident response (3)	Moderately confident response (2)	Slightly confident response (1)	Not at all confident response (0)	Coefficient (SE)†
Intercept	55 (62)	35 (31)	7 (5)	3 (2)	0.47‡ (0.21)
Item 7: Sweeping the floor (n = 192)	92 (97)	6 (3)	1 (0)	2 (0)	2.99‖ (0.34)
Item 8: Going out of the house to get to a car parked in the driveway (n = 197)	88 (94)	9 (5)	4 (1)	0 (0)	2.37‖ (0.29)
Item 4: Stretching to take a small can off a shelf at eye level (n = 196)	86 (93)	10 (6)	4 (1)	1 (0)	2.15‖ (0.28)
Item 1: Walking in the house (n = 197)	81 (90)	16 (8)	2 (1)	1 (0)	1.78‖ (0.27)
Item 14: Using an escalator while holding the ramp (n = 195)	82 (90)	16 (8)	1 (1)	1 (0)	1.77‖ (0.27)
Item 10: Crossing a parking lot to get to the shopping center (n = 195)	79 (87)	16 (11)	4 (1)	2 (1)	1.42‖ (0.26)
Item 9: Getting in and out of the car (regular car) (n = 196)	78 (85)	15 (13)	6 (2)	2 (1)	1.27‖ (0.25)
Item 12: Walking through a shopping center crowded with people who are in a rush (n = 194)	71 (76)	18 (20)	8 (3)	4 (1)	0.68§ (0.24)
Item 3: Bending down to pick up a slipper off the closet floor (n = 197)	69 (75)	19 (21)	9 (3)	3 (1)	0.63§ (0.23)
Item 11: Going up or down a slope (access ramp) (n = 196)	66 (73)	24 (23)	8 (3)	3 (1)	0.53‡ (0.23)
Item 2: Going up and down stairs (n = 196)	-	-	-	-	Reference item
Item 13: Getting jostled by people as you are walking through a shopping center (n = 194)	54 (52)	26 (38)	10 (7)	10 (3)	-0.39 (0.22)‡
Item 5: Getting up on your toes to reach an object over your head (n = 192)	52 (50)	29 (39)	9 (8)	10 (3)	-0.48‡ (0.22)
Item 6: Getting up on a chair (or a stepladder) to get an object (n = 193)	39 (31)	32 (47)	12 (14)	17 (7)	-1.27‖ (0.21)
Item 15: Using an escalator without being able to hold the ramp because your arms are full (n = 193)	32 (19)	30 (47)	12 (21)	26 (13)	-1.91‖ (0.21)

Abbreviations: SE, standard error;* Values were rounded off to the nearest integer. ; † Coefficients represent logits.
‡ p < .05;§ p < .01;‖ p < .001.

Table 3. Results of Final Multilevel Models Testing the Association between Balance Confidence and Perceived Balance, Balance Performance, Fear of Falling, and Falls Occurrence

Variables Tested in Multilevel Models (number of observations)	OR	95% CI	% of Variance Explained by Each Construct (in decreasing order)
Perceived balance (n = 197)			
Highest tertile	12.6‡	6.6-23.9	27
Middle tertile	2.8‡	1.6-5.0	
Fear of falling (n = 197)			
Occasionally or never fearful	7.3‡	4.3-12.1	27
One-leg stance, eyes closed, left side (n = 193)			
Highest tertile	5.2‡	2.7-10.2	12
Middle tertile	2.9†	1.5-5.5	
One-leg stance, eyes open, right side (n = 197)			
Highest tertile	5.3‡	2.6-10.8	11
Middle tertile	1.9*	1.0-3.5	
Tandem stance (n = 196)			
Highest tertile	4.6‡	2.3-9.1	10
Middle tertile	2.4†	1.3-4.5	
One-leg stance, eyes open, left side (n = 195)			
Highest tertile	4.9‡	2.3-10.1	9
Middle tertile	2.0*	1.0-3.8	
One-leg stance, eyes closed, right side (n = 196)			
Highest tertile	4.1‡	2.0-8.3	8
Middle tertile	2.1*	1.1-4.0	
Functional reach (n = 192)			
Highest tertile	4.6‡	2.2-9.7	7
Middle tertile	2.1*	1.1-4.3	
Tandem walking (n = 180)			
Highest tertile	3.0†	1.5-5.9	5
Middle tertile	2.2*	1.1-4.2	
Lateral reach, right side (n = 188)			
Highest tertile	2.5†	1.2-5.1	3
Middle tertile	2.2*	1.1-4.4	
Falls occurrence in the previous 12 months (n = 197)			
No fall	2.2†	1.3-3.8	3
Lateral reach, left side (n = 188)			
Highest tertile	1.8	0.9-3.5	0.3
Middle tertile	1.6	0.8-3.1	

Notes: The reference category for each variable represents participants in the lowest level of functioning (i.e., lowest perceived balance, lowest balance performance, experiencing fear of falling often or very often, having a history of one or several falls in the 12 previous months). The number of observations varies from one variable to another for a variety of reasons (e.g., refusal because of fatigue, fear of falling, or medical counterindications, or inability to perform the test).
Abbreviations: CI, confidence interval; OR, odds ratio.
*$p \leq .05$; †$p \leq .01$; ‡ $p \leq .001$.

APPENDIX 1: EQUATIONS FOR THE FINAL MULTILEVEL MODEL TESTING THE ASSOCIATION BETWEEN BALANCE CONFIDENCE AND PERFORMANCE ON THE TANDEM STANCE TEST

Level 1 equations:
Prob (R = 1 very confident | B) = P'(1) = P(1)
Prob (R $\leq$ 2 moderately confident | B) = P'(2) = P(1) + P(2)
Prob (R $\leq$ 3 slightly confident | B) = P'(3) = P(1) + P(2) + P(3)
Prob (R $\leq$ 4 not at all confident | B) = P'(4) = 1.0

Where:
P(1) = Prob[Y(1) = 1 | B]
P(2) = Prob[Y(2) = 1 | B]
P(3) = Prob[Y(3) = 1 | B]
$Ln[P'(1)/(1 - P'(1)] = \beta_{0j} + \Sigma\beta_{ij}$ (Item i)
$Ln[P'(2)/(1 - P'(2)] = \beta_{0j} + \Sigma\beta_{ij}$ (Item i) + threshold (2)
$Ln[P'(3)/(1 - P'(3)] = \beta_{0j} + \Sigma\beta_{ij}$ (Item i) + threshold (3)

Level 2 equations:
$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age_Mid) + γ_{02} (Age_High) + γ_{03} (Male) + γ_{04} (Educ_Low) + γ_{05} (Educ_Mid) + γ_{06} (Econ_Low) + γ_{07} (Econ_Mid) + γ_{08} (Tandem_Mid) + γ_{09} (Tandem_High) + υ_{0j};
$\beta_{1j} = \gamma_{10}$;
$\beta_{2j} = \gamma_{20}$;
$\beta_{3j} = \gamma_{30}$;
...;
$\beta_{15j} = \gamma_{150}$.

For i = 1 to 15, where $\beta_{3j} = 0$.

Other final models are analogous, although variables linked to coefficients $\gamma_{08}$and γ_{09} reflect operationalizations of perceived balance, balance performance on other tests, fear of falling, or falls occurrence.

CHAPITRE 7 -

IMPACT OF A MULTIFACETED COMMUNITY-BASED FALLS PREVENTION PROGRAM ON BALANCE-RELATED PSYCHOLOGICAL FACTORS (ARTICLE 4)

Johanne Filiatrault, erg., M.Sc., doctorante

Lise Gauvin, Ph.D.

Yvonne Robitaille, Ph.D.

Sophie Laforest, Ph.D.

Michel Fournier, M.A.

Lucie Richard, Ph.D.

Hélène Corriveau, pht., Ph.D.

Article sous presse pour la revue

Archives of Physical Medicine and Rehabilitation

Contribution des auteurs

Titre de l'article:

Impact of a multifaceted community-based falls prevention program on balance-related psychological factors

Johanne Filiatrault était responsable de la recension des écrits, des analyses et de la rédaction de l'article.

Yvonne Robitaille, Sophie Laforest et Lise Gauvin ont conceptualisé l'étude principale et le choix du devis au moment de la recherche de financement.

Yvonne Robitaille et Sophie Laforest ont aussi dirigé l'étude principale d'où sont issues les données de la présente étude et ont contribué à la rédaction de l'article.

Lise Gauvin a également soutenu l'étudiante dans les analyses statistiques et a collaboré à la rédaction de l'article.

Michel Fournier a fourni des conseils sur les analyses statistiques et a collaboré à la rédaction.

Lucie Richard a supervisé le travail de l'étudiante et a collaboré à la rédaction de l'article.

Hélène Corriveau a collaboré à la rédaction de l'article.

Accord des coauteurs

Johanne Filiatrault a obtenu l'accord des coauteurs d'inclure l'article intitulé « Impact of a multifaceted community-based falls prevention program on balance-related psychological factors » dans cette thèse de doctorat (voir formulaire à l'annexe 6).

IMPACT OF A MULTIFACETED COMMUNITY-BASED FALLS PREVENTION PROGRAM ON BALANCE-RELATED PSYCHOLOGICAL FACTORS

Johanne Filiatrault, O.T., M.Sc., Lise Gauvin, Ph.D.,

Lucie Richard, Ph.D., Yvonne Robitaille, Ph.D.,

Sophie Laforest, Ph.D., Michel Fournier, M.A., Hélène Corriveau, P.T., Ph.D.

The study was conducted from the Direction de santé publique de Montréal, Montreal, Quebec, Canada.

Institutional affiliations: From Institut national de santé publique du Québec, Montreal, QC, Canada (Filiatrault, Robitaille); Programme de doctorat en santé publique, Université de Montréal, Montreal, QC, Canada (Filiatrault); Groupe de recherche interdisciplinaire en santé (GRIS), Montreal, QC, Canada (Filiatrault, Gauvin, Richard, Laforest); École de réadaptation, Université de Montréal (Filiatrault); Département de médecine sociale et préventive, Université de Montréal, Montreal, QC, Canada (Gauvin, Robitaille); Centre de recherche Léa-Roback sur les inégalités sociales de santé de Montréal, Montreal, QC, Canada (Gauvin, Richard); Faculté des sciences infirmières, Université de Montréal, Montreal, QC, Canada (Richard); Centre de recherche de l'Institut universitaire de gériatrie de Montréal, Montreal, QC, Canada (Richard); Department of Epidemiology and Biostatistics, McGill University, Montreal, QC, Canada (Robitaille); Département de kinésiologie, Université de Montréal, Montreal, QC, Canada (Laforest); Centre de santé et de services sociaux Cavendish-Centre affilié universitaire en gérontologie sociale, Montreal, QC, Canada (Laforest); Direction de santé publique de Montréal, Montreal, QC, Canada (Fournier); Département de réadaptation, Université de Sherbrooke, Sherbrooke, QC, Canada (Corriveau); Centre de recherche sur le vieillissement, Institut universitaire de gériatrie de Sherbrooke, Sherbrooke, QC, Canada (Corriveau).

All communications and reprint requests should be addressed to:

Johanne Filiatrault, O.T., M.Sc.

Address : Université de Montréal, Faculté de médecine, École de réadaptation, C.P. 6128 succursale Centre-ville, Montreal, QC, Canada, H3C 3J7.

Phone number : (514) 343-6111 (ext. 0836); Fax number : (514) 343-2105

[redacted]

This study was supported by the Canadian Institutes of Health Research (Grant No. MOP 53123), the Regional Health and Social Services Boards of Montreal, Laval, and Montérégie. The first author received doctoral fellowships from the Fonds de la recherche en santé du Québec, the Ordre des ergothérapeutes du Québec, and the Faculté des études supérieures of the Université de Montréal.

Short running head: Psychological Impact of Falls Prevention

Key words: Accidental falls; Accident prevention; Balance; Psychological factors; Aged.

ABSTRACT

OBJECTIVE: To assess the impact of a multifaceted falls prevention program including exercise and educational components on perceived balance and balance confidence among community-dwelling seniors.

DESIGN: Quasi-experimental design.

SETTING: Community-based organizations.

PARTICIPANTS: Two hundred community-dwelling adults aged 60 years and over recruited by community-based organizations.

INTERVENTION: A 12-week multifaceted falls prevention program including three components (a 1-hour group exercise class held twice a week, a 30-minute home exercise module to be performed at least once a week, and a 30-minute educational class held once a week).

MAIN OUTCOME MEASURES: Perceived balance and balance confidence.

RESULTS: Multivariate analysis showed that the program was successful in increasing perceived balance in experimental participants. However, balance confidence was not improved by program participation.

CONCLUSIONS: This study shows that a multifaceted community-based falls prevention program that was successful in improving balance performance among community-dwelling seniors also had a positive impact on perceived balance. However, the program did not improve participants' balance confidence. These results suggest that balance confidence has other determinants than balance and that other new components and/or modifications of existing components of the program are required to achieve maximal benefits for seniors in terms of physical and psychological outcomes.

INTRODUCTION

Several studies have shown that falls prevention interventions including a balance exercise component can improve balance and reduce falls incidence among community-dwelling seniors.[1-8] Compared to the available evidence regarding the impact of these falls prevention interventions on physical outcomes, little is known about their impact on falls-related psychological factors, such as fear of falling, falls self-efficacy, or balance confidence.[9,10] Yet, several studies suggest that these factors can have adverse consequences on seniors' functioning and quality of life and thus, should be targeted by falls prevention programs.[11-20]

In response to this gap in the literature, this study examined the impact of a multifaceted community-based falls prevention program which includes balance exercise and educational components delivered in group with an ancillary home exercise program on two balance-related psychological factors, namely balance confidence and perceived balance.

Integrating Falls-Related Psychological Factors into Preventive Interventions

The need to consider falls-related psychological factors, such as fear of falling, balance confidence, or falls efficacy in preventive interventions with elderly people is increasingly recognized as evidence is accumulating about the influence of these factors on seniors' functioning and quality of life.[11-20] A phenomenon such as fear of falling is often reported by elderly people[21] and self-imposed activity restriction/avoidance is one of the strategies that is frequently adopted by seniors to deal with this fear.[22] Indeed, researchers that have documented rates of activity restriction as a response to fear of falling among community-dwelling seniors report proportions of up to 56 %.[17,20,21,23,24] Although some level of fear of falling or a lack of balance confidence may be considered protective for seniors when it leads to avoidance of hazardous activities like walking outside when sidewalks are icy, it can also lead to exaggerated activity avoidance (i.e. curtailment of activities that are within the range of a person's capabilities). Excessive activity curtailment can lead to a physical deconditioning which in turn can interfere with independence. Ultimately, such physical and functional decline can lead to an increase in falls risk. In fact, there is evidence from longitudinal studies that fear of falling and low falls self-efficacy are independent predictors of falls and quality of life among community-dwelling seniors.[11-14] Besides these adverse effects, fear of falling can also lead to social isolation and depression.[14,15,17,25]

Unlike the evidence that is available regarding the impact of falls prevention interventions that include a balance exercise component on balance performance and falls incidence among community-dwelling seniors, there is more limited evidence about the impact of these interventions on falls-related psychological factors.[9,10] Recent systematic reviews suggest that community-based Tai Chi programs delivered in groups, home-based individualized exercise interventions, and multifaceted home-based interventions combining education on several falls risk factors with exercise can have a positive impact on falls-related psychological outcomes.[9,10] However, more evaluative research is needed to provide evidence-based state-of-the-art guidelines to interventionists about the best strategies to adopt when targeting psychological factors.[26,27] In particular, more research is needed on the impact of community-based falls prevention interventions that include a balance exercise component delivered in group. Indeed, the few studies that have examined the psychological outcomes of such interventions do not provide evidence for concluding that they have a positive impact on falls-related psychological factors among community-dwelling seniors.[9,10]

Another issue that has not been addressed in evaluative studies is whether or not changes in balance performance observed following balance exercise interventions are associated with the degree of change in falls-related psychological outcomes. Addressing this issue is relevant since it could provide valuable information about the processes underlying changes in falls-related psychological outcomes.

In light of these considerations, the primary objective of this study was to examine the impact of a multifaceted falls prevention program including balance exercise and educational components on two psychological factors related to balance, namely balance confidence and perceived balance. A secondary objective was to examine if changes in balance performance following the intervention are associated with changes in these psychological outcomes.

METHODS

Context of the Study

This study was conducted within the context of a larger investigation[8] (referred as the main investigation in the remainder of the paper) of the impact of a community-based falls prevention program called *Stand Up!* on balance performance. In keeping with recent recommendations aimed at improving translation of public health research results into practice[28-31], this investigation was conducted in real-world conditions of community-based organizations. Results of this investigation showed that *Stand Up!* was successful in improving balance performance among community-dwelling seniors.[8]

Given the positive impact of the program on participants' balance and existing research showing that selected programs can improve falls-related psychological factors, the working hypothesis of the current study was that *Stand Up!* would also increase participants' balance confidence and perceived balance.

The Intervention

Stand Up! is a 12-week multifaceted program designed for community-dwelling seniors who have experienced at least one fall in the previous 12 months and/or are afraid of falling or concerned about their balance.[8,32] The program includes three components: 1) group exercise classes (an hour, twice a week); 2) a home exercise module (30 minutes, at least once a week); and 3) group educational classes (30 minutes, once a week). The program's main goals are to improve seniors balance and strength in the lower limbs, and improve seniors' ability to reduce hazards in their home and adopt safe behaviors. More specifically, the objectives of the exercise components of the program are : 1) to improve balance, lower limb strength and ankle flexibility; 2) to stimulate proprioception; 3) to maintain bone density in vulnerable areas (e.g., wrists, hips); and 4) to improve seniors' capacity to get up after a fall. Exercise components were especially designed to stimulate all subsystems involved in balance (neuromuscular, vestibular, proprioceptive, and visual systems) and to be constantly challenging for participants to stimulate improvements in balance.[33] Exercise classes unfold in four sequential steps: 1) Warm-up exercises; 2) Balance exercises; 3) Strengthening exercises; and 4) Stretching exercises. Figure 1 provides examples of each type of exercises.

[Insert Figure 1 here]

The home exercise module includes 12 simple exercises to be practiced at least once a week during the program. These exercises are explained and practiced during the first group class of the program. They are illustrated on a small poster that can be used at home as a reminder and practice guide.

The program's educational component consists of 10 classes of 30 minutes that address home environmental hazards and risky behaviors as well as strategies to avoid falls and fall-related injuries (e.g., reducing hazards in home environment, wearing safe shoes, and using medication with caution).

The program was designed to be offered by community-based organizations to groups of 10 to 15 seniors. Since the program targets seniors that have fallen and/or seniors that are concerned about their balance or falling, it is recommended that the program be led by rehabilitation or physical activity professionals. More detailed information about the program can be found in a recent publication[32] and a detailed program guide is also available to instructors.[34,35]

Design

Since the main investigation aimed at examining the program's effectiveness under real-world conditions (i.e., when offered and implemented by community-based organizations), a quasi-experimental pre-post design was chosen. Therefore, randomization of participants was excluded to interfere as little as possible with the regular functioning (including regular recruitment procedures) of community-based organizations. Randomization of organizations was also rejected because this would have led to the exclusion of some organizations that were already providing a version of the program in their community, thereby creating an artificial situation.

To recruit organizations for the main investigation, an invitation was sent to the representatives of community-based organizations that provided services to older adults and had previously expressed an interest in the program. Representatives of 10 organizations were invited to recruit experimental participants and to offer the program in their community. No incentives (e.g., transport, money) were offered for participating in the program. Moreover, seven organizations agreed to recruit control participants and to wait until the end of the study's experimental phase (i.e., 12 months) to offer the program in their community.

To insure that experimental and control groups would be assessed under similar seasonal conditions, efforts were made to balance recruitment of experimental and control groups across seasons. Some groups entered the study in the spring (2 experimental and 2 control groups) and the other groups entered the study in the following fall (8 experimental and 5 control groups).

For inclusion in the study, participants had to be at least 60 years old, be able to participate in a group exercise program as assessed by a pre-selection grid especially designed for the program, be exempt from cognitive deficits and from disabling conditions (e.g., Parkinson disease and multiple sclerosis), and be able to speak either English or French. Furthermore, in keeping with the program target population, recruitment was publicized as a search for persons with one or several of the following characteristics: 1) having fallen once or several times in the 12 previous months; 2) being afraid of falling; and 3) expressing a concern about balance. Each person recruited provided written informed consent before participating in the research project. The main investigation and the present study were both approved by the Montreal Regional Health and Social Services Board Ethics Committee.

Participants

Among a total of 212 eligible seniors living in the Montreal area (Quebec, Canada) that were initially recruited by community-based organizations to participate in the main investigation, 12 did not attend the baseline evaluation. Of the 200 registrants at baseline, 98 participated in the program (experimental participants) and 102 participated as control group members and did not receive any intervention. Control group participants were informed that they could participate in the program after completion of the experimental phase of the study. More details regarding participants' recruitment process can be found in a previous publication.[8] A sample size of 200 was judged sufficient for the main investigation to have a power of 80% to detect a 15% difference in balance improvement.

Data Collection Procedures

Two strategies were used for data collection. Face-to-face interviews conducted by trained interviewers allowed for collecting data about a range of variables including sociodemographic factors, balance-related psychological variables, falls and health-related variables. Balance performance tests were also administered by trained physical therapists. Interviewers and physical therapists were blind to participants' group assignment. Each assessment lasted approximately 2 hours and took place in community-based organizations in participants' residential neighborhood. Data collected at baseline and at post-test were used in the present study.

Measures

Dependent Variables

The dependent variables for this study were the two balance-related psychological outcomes assessed at baseline and immediately after the intervention, namely balance confidence and perceived balance. Balance confidence was measured with a simplified version of the Activities-specific Balance Confidence (ABC) Scale.[36,37] The original ABC Scale is a questionnaire assessing a person's confidence level in avoiding losses of balance during 16 tasks related to daily living. With its wide range of item difficulties, the ABC Scale seems well suited for populations presenting a diversity of levels of functioning, including high functioning community-dwelling seniors. Despite good psychometric qualities, modifications to the ABC Scale were deemed necessary to improve the scale's user-friendliness for use among seniors and to promote a better congruence of the scale with public health falls prevention strategies. The simplified version of the scale (designated as the ABC-Simplified or ABC-S) has more user-friendly cue question and response format, and includes 15 items instead of 16. The modified cue question is *"Up to what point are you confident that you will maintain your balance when you do the following activities?"*. The original 0-100% response format for each item was replaced by a 4-category response format with descriptive anchors (i.e., 0=not at all confident, 1=slightly confident, 2=moderately confident, and 3=very confident). In a recent psychometric study, the ABC-S showed good internal consistency (reliability index = .86) and good convergent validity with balance performance, perceived balance, fear of falling, and falls history.[37] The study also allowed to establish the item hierarchy of the scale as a function of ascending difficulty. Furthermore, the study showed the cogency of using a global balance confidence score (ranging from 0 to 45) computed by the simple addition of scores obtained on the items of the simplified scale.

The second outcome measure considered in this study was participants' perceived balance. It was measured with a single question (*"Using the following scale, show me how good you think your balance is"*) and a Likert-type rating scale with anchors ranging from 1 (poor balance) to 10 (excellent balance). Initial validation of this measure shows its convergent validity with the One-Leg Stance test, eyes open (right and left sides), the One-Leg Stance test, eyes closed (right side), the Functional Reach, the Tandem Stance test, and the Tandem Walking test.[38]

Independent Variables

Group membership (0=control or 1=experimental) was the independent variable that allowed for testing whether or not the falls prevention program had an impact on the two balance-related psychological outcomes.

Control Variables

Control variables included sociodemographics (age, sex, education level, perception of personal economic conditions, living conditions), falls history, perceived health, use of medications associated with falls, mental health, and balance performance.

Falls history was assessed by asking each participant how many times they had fallen in the previous 12 months. A fall was defined as "an event which results in a person's coming to rest inadvertently on the ground or other lower level".[39] The recorded number of falls was dichotomized for analysis (0 = no fall; 1 = one fall or more). Perceived health was assessed with the following question *"Compared to other people your age, would you say that overall your health is ..."* and a 5-category response scale (recoded 1=bad or average; 2=good or very good; 3=excellent). Medication use was coded 1 if the person used one or more medications associated with falls (e.g., sedatives) in the two previous days and 0 if the person did not. Mental health was measured with the mental health subscale of the SF-36 health survey questionnaire.[40] This subscale includes five items and produces a continuous global score ranging from 0 to 100, with higher scores indicating higher functioning.

Balance performance was assessed with a series of balance performance tests including the One-Leg Stance test[41], the Tandem Stance test[42], the Functional Reach test[43] and Lateral Reach test[44] and the Tandem Walking test[45]. All these tests have shown good psychometric properties.[46,47] The measurement protocol for these tests has been described in detail elsewhere.[37]

All control variables included in the analysis were assessed at baseline, with the exception of change in balance performance. For the latter, balance performance measures collected at baseline and post-test were used to compute a residualized change score. Dummy variables were created for each categorical variable.

Missing data

No data imputation was performed because most of the missing data occurred for participants who did not complete the ABC-S scale or the perceived balance scale at post-test. The corresponding cases were simply deleted from data analysis. In the secondary analyses dealing with the association between changes in balance-related psychological outcomes and changes in balance performance, we lost additional cases because of missing observations on some balance performance tests. However, these missing observations represented less then 5% of observations for all balance tests, with the exception of Tandem Walking. Thus, we felt that a complex data imputation procedure was not warranted.

Statistical Analysis

Data were analyzed on an intention-to-treat basis. First, descriptive analyses were performed to obtain a profile of participants' characteristics at baseline and to examine the evolution in the two psychological outcomes from baseline to post-test in both groups of participants. Bivariate analyses (including Student t-tests and chi-square tests) were carried out on baseline data to detect differences between experimental and control groups. Dropouts were also compared with participants who remained in the study.

Given the asymmetric distribution of participants' global balance confidence scores (more scores toward the high balance confidence side of the scale), a square root transformation was applied to the data prior to multivariate analyses. Scores obtained for perceived balance did not require any transformation since their distribution was normal.

The program's impact on balance confidence and perceived balance was examined using three series of linear regression models, one for each of the following dependent variables: 1) raw balance confidence scores; 2) transformed balance confidence scores; and 3) raw perceived balance scores. All regression analyses were performed by testing variables according to the five following steps: 1) inclusion of group membership and baseline scores obtained for balance confidence or perceived balance; 2) addition of sociodemographic variables (age, sex, education level, socioeconomic conditions, living conditions); 3) addition of falls and health variables (perceived health, use of medications associated with falls, and mental heath); 4) addition of residualized balance performance change scores from baseline to post-test to test for associations between change in balance performance and changes on balance confidence or perceived balance; and 5) addition of interaction terms (group membership by baseline balance confidence or baseline perceived balance scores) to test for moderating effects of baseline levels of balance confidence and perceived balance on program impact. Residualized changes in balance performance were included only for those five balance tests that had shown significant improvement in the main investigation[8] with the same sample, namely the One-Leg Stance with eyes open (right and left sides), the One-Leg Stance with eyes closed (left side), the Tandem Stance, and the Tandem Walking tests.[8] Residualized scores were entered in separate models for each balance performance test to maximize datasets. All analyses were performed using SPSS (version 11.5).

RESULTS

Among the 200 registrants at baseline, 197 were eligible for the present study (three participants were excluded because they provided unusable responses to the ABC-S scale (i.e. one participant had slight communication problem and two others responded hurriedly). Table 1 presents baseline characteristics for the full study sample (n=197) and for each group (96 experimental and 101 control participants). The 197 participants were aged on average 74 years and included mostly women (84.3%). Education levels were varied and most participants (67.5%) were of average financial means. More than 80% of participants perceived their health as being good, very good or excellent. Almost 40% of the sample had a history of falls in the previous year. The mean baseline balance confidence score on the ABC-S was 37.6 (for a maximal score of 45). The mean perceived balance score was somewhat higher than the mid-point on a scale from 1 to 10. There was substantial heterogeneity in terms of balance performance reflected by large standard deviation values obtained for balance performance tests. Comparison of baseline data in each group did not reveal any significant difference, except for lateral reach performances which were somewhat higher in the experimental group ($p < .05$).

[Insert Table 1 here]

Among the 197 participants, 18 did not complete the ABC-S scale at post-test (11 in the control groups and 7 in the experimental groups). These 18 participants lost to follow-up did not differ from participants remaining in the study for most of the data included at baseline, except that a larger proportion of dropouts lived alone and had poorer scores on the One-Leg Stance performed with eyes open ($p < .05$), and a smaller proportion of dropouts had fallen in the previous year ($p < .05$).

Group Attendance and Compliance with Home Exercises

Participants in the experimental group attended an average of 78% of group classes. Compliance with the home exercises was also satisfying, as 78% of experimental participants from this study reported performing the home exercise program at least once a week.

Outcome Measures

Baseline and Post-Test Profiles

Outcome measures obtained at baseline and post-test are presented in Table 2 for both groups of participants. As can be observed, mean perceived balance improved in experimental participants and decreased in control participants. However, mean balance confidence scores slightly decreased in both groups from baseline to post-test.

[Insert Table 2 here]

Multivariate Analyses

Results of regression models testing the effect of the program on balance confidence and perceived balance are presented in Tables 3 and 4 respectively. Models are presented according to steps for variable inclusion described in the methods. Results for the last step of variable inclusion (i.e., inclusion of interaction terms in models) are not presented in the tables because they were not statistically significant.

Given the similarity observed in the results obtained with the raw and transformed balance confidence scores and for ease of interpretation, Table 3 presents the results obtained with untransformed data. Results of linear regression models showed a non significant impact of the program on balance confidence. Indeed, regression coefficients for group membership were not significant in the first model and in subsequent models adjusting for an increasing number of variables. The only significant predictor of balance confidence at post-test was baseline balance confidence. The association was in the expected direction: higher balance confidence at baseline was associated with highest post-test balance confidence.

[Insert Table 3 here]

However, results presented in Table 4 show a significant effect of group membership on perceived balance, reflecting a positive impact of the program on this variable. In the first model (controlling only for baseline perceived balance score), the regression coefficient associated with group membership was statistically significant (unstandardized beta coefficient = 0.83, $p < .01$) indicating that overall, participants in the experimental group had a post-test score on perceived balance of 0.83 above post-test score of the control group participants once baseline values were controlled for. As depicted in Table 4, this result remained relatively unchanged with the addition of an increasing number of control variables (sociodemographic, health characteristics, residualized changes in balance performance). Besides group membership, two other variables predicted perceived balance at post-test: perceived baseline score and age. Associations were in the expected direction: higher perceived balance at baseline was associated with greater perceived balance at post-test and higher age was associated with poorer perceived balance at post-test. Other control variables were not significant, including the indicators of change in balance performance tests.

[Insert Table 4 here]

DISCUSSION

The primary objective of this study was to examine the impact of a multifaceted falls prevention program (*Stand Up!*) that included balance exercise components combined with an educational component on two balance-related psychological factors, namely balance confidence and perceived balance. This study is important since there is growing evidence that fear of falling or other related psychological factors are independent predictors of falls and can have adverse consequences on seniors' functioning and quality.[11-20] Compared to physical outcomes, few data are available regarding the falls-related psychological outcomes of falls prevention interventions designed for community-dwelling seniors. More specifically, few studies have examined the psychological impact of community-based falls prevention interventions that include a balance exercise component delivered in a group format.[9,10]

Of initial interest is the positive impact of *Stand Up!* on participants' perceived balance. This result is consistent with the positive changes observed in participants' balance performance following the intervention. Indeed, a study of the program's impact on balance performance showed that it improved seniors performance on the One-Leg Stance performance (eyes open, both sides), the One-Leg Stance (eyes closed, left side), the Tandem Stance and the Tandem Walk tests.[8] These findings are also in line with other results obtained among this study sample that showed significant associations between seniors perceived balance and scores on a number of balance performance tests.[38] The improvement in perceived balance suggests that seniors acknowledge the positive changes that the program had on their balance.

A second result to discuss is the absence of an effect of *Stand Up!* on balance confidence. Obviously, the positive change in participants' balance performance and perceived balance which occurred following the program was not accompanied by a similar change in participants' level of balance confidence. Given the association often observed between balance performance and balance confidence[37,48], these results seem surprising at first glance.

Several plausible explanations could elucidate the lack of improvement in balance confidence following the program. First, it is possible that balance confidence has other determinants than balance performance and perceived balance. Although the program is multifaceted and addresses several falls risk factors, it is possible that other important determinants of balance confidence are not addressed by the program. For example, like fear of falling, balance confidence may be influenced by a person's anxiety level or a depressive state which were not targeted by the *Stand Up!* program.[15]

A second explanation of the findings is that the duration of the program (i.e., 12 weeks) is not sufficient to allow participants' to experience a sense of mastery regarding their balance abilities. Indeed, *Stand Up!* exercises are quite challenging in terms of balance and the difficulty level of exercises increases from one week to the next. Thus, it is possible that this progression was too rapid to allow any improvement in balance confidence. Assessing the impact of a longer version of the program (e.g., a 24-week rather than a 12-week long program) would allow for supporting or ruling out this possibility. Studies have shown that Tai Chi programs have a positive impact on several falls-related psychological outcomes[49-51], namely on balance confidence. However, these programs are generally more intensive and/or of longer duration than *Stand Up!*.

A third explanation regarding the lack of improvement in balance confidence following the program is that a potential positive effect of the program's exercises on balance confidence might have been attenuated by a negative effect of the educational component of the program. The educational component of the program includes information regarding several falls risk factors. By raising awareness about a number of intrinsic and extrinsic falls risk factors, it is possible that the educational component of the program cancelled out the exercises' benefit in terms of balance confidence. Multifaceted interventions (i.e., those that use a combination of strategies) such as *Stand Up!* are particularly challenging for evaluative research because it is not possible to determine the independent effects of each component.[1] An evaluation of each component of *Stand Up!* would allow for an assessment of the impact of the educational component versus the exercise component of the program, and thus, the testing of a possible antagonistic effect of both components on balance confidence.

A fourth explanation for a lack of improvement in balance confidence following participation in *Stand Up!* is that the program does not include a sufficient volume of "functional" exercises, i.e. exercises that are closely related to day-to-day functioning. During activities of daily living, balance is challenged through a diversity of motor experiences (e.g., walking, standing, reaching, carrying) and in varied and dynamic environments. Increasing balance confidence associated with tasks from day-to-day functioning could require several exercises that simulate activities of daily living. Supporting this idea, a recent study showed that a 5-week training program involving an obstacle course which mimics activities of daily life with potential falls risks successfully improved balance confidence among community-dwelling seniors.[52] More specifically, this exercise program was dedicated to balance, gait, and coordination, and included 10 sessions of 1.5 hour each. The obstacle course included tasks such as walking over doorsteps, uneven pavement, and other kinds of ground surface. In order to simulate the complexity of daily life, some of the balance and gaits tasks were carried out with additional motor or cognitive tasks, and under visual constraints. Some walking exercises also simulated walking in a crowded environment and involved many changes in speed and direction. Although the group exercise component of *Stand Up!* includes the use of an obstacle course at the 6th,7th, 10th, 11th and 12th weeks of training, it is possible that this training is not prominent enough in the program to improve balance confidence.

One last explanation regarding lack of impact of the program on balance confidence despite improved balance performance might be that participants with improved balance may have become more active and thus, may have put themselves at greater risk for loosing their balance and falling. Such effects were observed in a study of the effects of a brisk walking program in postmenopausal women.[53]

The results of this study regarding balance confidence are consistent with other evaluations of community-based group programs including exercise delivered in a group format and educational components.[1,54] Indeed, in these studies, improvements in seniors' balance performance following community-based group exercise interventions were not accompanied by benefits on falls-related psychological factors. The explanations mentioned previously for the lack of improvement in balance confidence following *Stand Up!* could also be applied to these programs.

Regarding the second objective of this study, the results show that changes in balance performance following the intervention were not associated with changes in balance-related psychological outcomes, as the inclusion of residualized changes in balance in the regression models did not change findings. This is a little surprising given the correlations observed cross-sectionally between both psychological factors and balance performance in other studies.[37,48] Other researchers found that changes in balance confidence (as measured by the ABC Scale) following resistance or agility training in group sessions did not significantly correlate with change in other factors such as postural stability, and gait speed.[55] These results indicate that even though balance performance, balance confidence, and perceived balance are associated cross-sectionally, these factors do not necessarily change according to similar patterns. These results suggest that other factors than an improvement in balance performance are required to observe a corresponding change in balance confidence or perceived balance. The study of other potential factors associated with change should be the focus of future investigations. In sum, findings suggest that different ingredients may be required in falls prevention interventions to achieve maximal benefits in terms of physical and psychological outcomes.

Strengths and Limitations of the Study

This study responds to a need to examine the impact of interventions on falls-related psychological factors among seniors.[9,10,26,27] The study is also in keeping with recommendations of selected researchers that more public health studies should move beyond randomized controlled trials and use designs that allow for examination of program effectiveness under more natural conditions. Indeed, such studies are required to allow a true transfer of research knowledge into public health practice.[28-31] The use of a rigorous methodology (e.g.: blinding procedures, training of interviewers and physical therapists, and multivariate analyses) is also a strength of the study. On the downside, the use of a non randomized design does not completely exclude the possibility that a confounding variable was not controlled for in the analysis. Also, although a recent psychometric study has shown that the ABC-S scale was a valid and reliable assessment tool[37], other psychometric studies designed to examine its sensitivity to change are warranted. The perceived balance scale would also benefit from further psychometric studies.

Directions for Future Research

Future studies testing the aforementioned plausible explanations for the lack of improvement in balance confidence are warranted. Results of such studies would allow for improving falls prevention programs such as *Stand Up!*. In addition, studies examining the impact of changes of in balance confidence and perceived balance on quality of life and activity restriction/avoidance would allow for a better depiction of the clinical significance of any changes in balance-related psychological factors. Moreover, we note that falls prevention research tend to focus on the idea that fear of falling, low balance confidence, or low falls efficacy are always negative factors. It should not be forgotten that there is also a positive side to these emotional dimensions which sometimes reflect the presence of a real environmental threat to the person's balance. Indeed, some fear of falling or low balance confidence may be appropriate under specific conditions (i.e., when the person faces tasks that could be considered hazardous considering his/her physical capabilities), and could actually prevent falls. Thus, future studies that focus on distinguishing excessive psychological reactions from those that could be considered realistic and protective are certainly warranted.

CONCLUSIONS

Falls prevention programs that include balance exercise and address multiple falls risks factors are among recommended strategies according to evidence-based practice guidelines.[56,57] This study examined the impact of a multifaceted community-based falls prevention program that includes balance exercise and educational components on balance confidence and perceived balance. This study is important as evidence is growing that psychological factors such as fear of falling, balance confidence, and falls efficacy are associated with seniors' health and quality of life, and therefore, should be included as important targets of falls prevention programs. Findings from this study showed that the program can not only achieve improved balance performance among seniors but can also improve perceived balance. However, a similar improvement was not observed on balance confidence. Findings also suggest that an increase in balance performance is not sufficient to impact on balance-related psychological factors, and that additional ingredients and/or modifications of existing components of the program are required to achieve maximal benefits in terms of physical and psychological outcomes.

ACKNOWLEDGMENTS

We would like to acknowledge the contribution of Manon Parisien and Carole Genest to the study's data collection. We would also like to thank seniors and collaborators from community-based organizations for their participation in the study.

REFERENCES

1. Barnett A, Smith B, Lord SR, Williams M, Baumand A. Community-based group exercise improves balance and reduces falls in at-risk older people: A randomised controlled trial. Age Ageing 2003;32:407-14.
2. Campbell AJ, Robertson MC, Gardner MM, Norton RN, Tilyard MW, Buchner DM. Randomized controlled trial of a general practice programme of home based exercise to prevent falls in elderly women. BMJ 1997;315:1065-9.
3. Chang JT, Morton SC, Rubenstein LZ, Mojica WA, Magione M, Suttorp MJ, Roth EA, Shekelle PG. Interventions for the prevention of falls in older adults: systematic review and meta-analysis of randomised clinical trials. BMJ 2004; 328:680-3.
4. Day L, Fildes B, Gordo I, Fitzharris M, Flamer H, Lord S. Randomised factorial trial of falls prevention among older people living in their own homes. BMJ 2002;325:128-31.
5. Gardner MM, Robertson MC, Campbell AJ. Exercise in preventing falls and fall-related injuries in older people: A review of randomised controlled trials. Br J Sports Med 2000;34:7-17.
6. Province MA, Hadley EC, Hornbrook MC, Lipsitz LA, Miller JP, Mulrow CD, Ory MG, Sattin RW, Tinetti ME, Wolf SL. The effects of exercise on falls in elderly patients. A preplanned meta-analysis of the FICSIT trials. J Am Med Assoc 1995;273:1341-7.
7. Robertson MC, Devlin N, Gardner MM, Campbell AJ. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. BMJ 2001;322:697-701.

8. Robitaille Y, Laforest S, Fournier M, Gauvin L, Parisien M, Corriveau H, Trickey F, Damestoy N. Moving forward in fall prevention: An intervention to improve balance among older adults in real-world settings. Am J Public Health 2005;95:2049-56.

9. Filiatrault J, Gauvin L, Laforest S, Robitaille Y, Fournier M, Richard L, Corriveau H. (Submitted). The impact of preventive interventions offered to community-dwelling seniors on falls-related psychological factors: A review. *Preventive Medicine.*

10. Zijlstra GAR, van Haastregt JCM, van Rossum E, van Eijk JThM, Yardley L, Kempen GIJM. Interventions to reduce fear of falling in community-living older people: A systematic review. J Am Geriatric Soc 2007;55:603-15.

11. Cumming RG, Salkeld G, Thomas M, Szonyi G. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. J Gerontol A Biol Sci Med Sci 2000;55:M299-305.

12. Delbaere K, Crombez G, Vanderstraeten G, Willems T, Cambier D. Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. Age Ageing 2004;26:1-6.

13. Friedman SM, Munoz B, West SK, Rubin GS, Fried LP. Falls and fear of falling: Which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. J Am Geriatr Soc 2002;50:1329-35.

14. Arfken CL, Lach HW, Birge SJ. The prevalence and correlates of fear of falling in elderly persons living in the community. Am J Public Health 1994; 84:565-70.

15. Gagnon N, Flint AJ, Naglie G, Devins GM. Affective correlates of fear of falling in elderly persons. Am J Geriatr Psychiatry 2005;13:7-14.

16. Howland J, Peterson EW, Levin WC, Fried L, Pordon D, Bak S. Fear of falling among the community-dwelling elderly. J Aging Health 1993;5:229-43.

17. Howland J, Lachman ME, Peterson EW. Covariates of fear of falling and associated activity curtailment. Gerontologist 1998;38:549-55.

18. Li F, Fisher KJ, Harmer P, McAuley E, Wilson NL. Fear of falling in elderly persons: association with falls, functional ability, and quality of life. J Gerontol B Psychol Sci Soc Sci 2003;58:P283-90.

19. Mendes de Leon CF, Seeman TE, Baker DI, Richardson ED, Tinetti ME. Self-efficacy, physical decline, and change in functioning in community-living dwellers: A prospective study. J Gerontol B Psychol Sci Soc Sci 1996;51: S183-90.

20. Tinetti ME, Mendes de Leon CF, Doucette JT, Baker DI. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. J Gerontol A Biol Sci Med Sci 1994;49:M140-7.

21. Zijlstra GAR, van Haastregt JCM, van Eijk JThM, van Rossum E, Stalenhoef PA, Kempen GIJM. Prevalance and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. Age Ageing 2007;36:304-9.

22. McCormack G, Lewin G, McCormack B, Helmes E, Rose E, Naumann F. Pilot study comparing the influence of different types of exercise intervention on the fear of falling in older adults. Austral J Ageing 2004;23:131-5.

23. Fletcher PC, Hirdes JP. Restriction in activity associated with fear of falling among community-based seniors using home care services. Age Ageing 2004;33:272-9.

24. Murphy SL, Williams CS, Gill TM. Characteristics associated with fear of falling and activity restriction in community-living older persons. J Am Geriatr Soc 2002;50:516-20.

25. Downton JH, Andrews K. Postural disturbance and psychological symptoms amongst elderly people living at home. Int J Geriatr Psychiatry 1990;5:93-8.

26. Lach HW. Fear of falling: an emerging public health problem. Generations. J Am Soc Aging 2002;26:33-7.

27. Legters K. Fear of falling. Phys Ther 2002;82:264-72.

28. Glasgow RE, Lichtenstein E, Marcus AC. Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. Am J Public Health 2003;93:1261-7.

29. Victora CG, Habicht J-P, Bryce J. Evidence-based public health: Moving beyond randomized trials. Am J Public Health 2004;94:400-5.

30. Prohaska T, Belansky E, Belza B, Buchner D, Marshall V, McTigue K, Satariano W, Wilcox S. Physical activity, public health, and aging: Critical issues and research priorities. J Gerontol B Psychol Sci Soc Sci 2006;61: S267-73.

31. Sanson-Fisher RW, Bonevski B, Green LW, D'Este C. Limitations of the randomized controlled trial in evaluating population-based health interventions. Am J Prev Med 2007;33:155-61.

32. Filiatrault J, Parisien M, Laforest S, Genest C, Gauvin L, Fournier M, Trickey F, Robitaille Y. Implementing a community-based falls prevention program: from drawing board to reality. Can J Aging 2007;26:213-26.

33. Berg KO, Kairy D. Balance interventions to prevent falls. Generations 2002; 26:75-8.

34. Trickey F, Parisien M, Laforest S, Genest C, Robitaille Y. *Stand Up! A fall prevention programme for seniors. Programme Guide.* Montreal, QC: Direction de santé publique de Montréal; 2003.

35. Trickey F, Parisien M, Laforest S, Genest C, Robitaille Y. *Programme intégré d'équilibre dynamique – PIED. Guide d'animation.* Montréal, QC: Direction de santé publique de Montréal; 2002.

36. Powell LE, Myers AM. The Activities-specific Balance Confidence (ABC) Scale. J Gerontol A Biol Sci Med Sci 1995;50:M28-34.

37. Filiatrault J, Gauvin L, Fournier M, Parisien L, Laforest S, Robitaille Y, Corriveau H, Richard L. Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors. Arch Phys Med Rehabil 2007;88:664-72.

38. Filiatrault J, Robitaille Y, Gauvin L, Laforest S, Parisien M, Fournier M, Richard L. L'auto-évaluation de l'équilibre : Utile en prévention des chutes ? *Recueil des résumés de communications de la Conférence internationale « Vers une nouvelle perspective : du vieillir au bien-vieillir »*, p. 49; 2004.

39. O'Loughlin JL, Robitaille Y, Boivin J-F, Suissa, S. Incidence of and risk factors for falls ad injurious falls among the community-dwelling elderly. Am J Epidemiol 1993; 137:342-54.

40. Ware JJ, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I - Conceptual framework and item selection. Med Care 1992;30:473-83.

41. Gehlson GM, Whaley MH. Falls in the elderly: Part II – Balance, strength and flexibility. Arch Phys Med Rehabil 1990;71:739-41.

42. Heitman DK, Gossman MR, Shaddeau SA, Jackson JR. Balance performance and step width in non institutionalized elderly female fallers and non fallers. Phys Ther 1989;69:923-31.

43. Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. J Gerontol Bio Sci Med Sci 1990;45:192-7.

44. Brauer S, Burns Y, Galley P. Lateral reach: A clinical measure of medio-lateral postural stability. Physiother Res Int 1999;4:81-8.

45. Baloh RW, Fife TD, Zwerling L, Socotch T, Jacobson K, Bell T, Beykirch K. Comparison of static and dynamic posturography in young and older normal people. J Am Geriatr Soc 1994;42:405-12.

46. Franchignoni F, Tesio L, Martino MT, Ricupero C. Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. Aging Clin Exper Res 1998;10:26-31.

47. MacKight C, Rockwood K. Assessing mobility in elderly people. A review of performance-based measures of balance, gait and mobility for bedside use. Rev Clin Gerontol 1995;5:464-86.

48. Hatch J, Gill-Body KM, Portney LG. Determinants of balance confidence in community-dwelling elderly people. Phys Ther 2003;83:1072-79.

49. Zhang J-G, Ischikawa-Takata K, Yamazaki H, Morita T, Ohta T. The effects of Tai Chi Chuan on psychological function and fear of falling in the less robust elderly: An intervention study for preventing falls. Arch Gerontol Geriatr 2005; 42:107-16.

50. Li F, Harmer P, Fisher KJ, McAuley E, Chaumeton N, Eckstrom E, Wilson NL. Tai Chi and falls reductions in older adults: a randomized controlled trial. J Gerontol A Biol Sci Med Sci 2005;60:M187-94.

51. Sattin RW, Easley KA, Wolf SL, Chen Y, Kutner MH. Reduction in fear of falling through intense Tai Chi exercise training in older, transitionally frail adults. J Am Geriatr Soc 2005;53:1168-78.

52. Weerdesteyn V, Rijken H, Geurts AC, Smits-Engelsman BC, Mulder T, Duysens J. A five-week exercise program can reduce falls and improve obstacle avoidance in the elderly. Gerontology 2006;52:131-41.

53. Ebrahim S, Thompson PW, Baskaran V, Evans K. Randomized placebo-controlled trial of brisk walking in the prevention of postmenopausal osteoporosis. Age Ageing 1997;26:253-60.

54. Devereux K, Robertson D, Briffa NK. Effects of a water-based program on women 65 years and over: A randomised controlled trial. Austral J Physiother 2005;51:102-8.

55. Liu-Ambrose T, Khan KM, Eng JJ, Lord SR, McKay HA. Balance confidence improves with resistance or agility training. Gerontology 2004;50:373-82.

56. Feder G, Cryer C, Donovan S, Carter Y. Guidelines for the prevention of falls in people over 65. BMJ 2000;321:1007-11.

57. American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. J Am Geriatr Soc 2001;49:664-72.

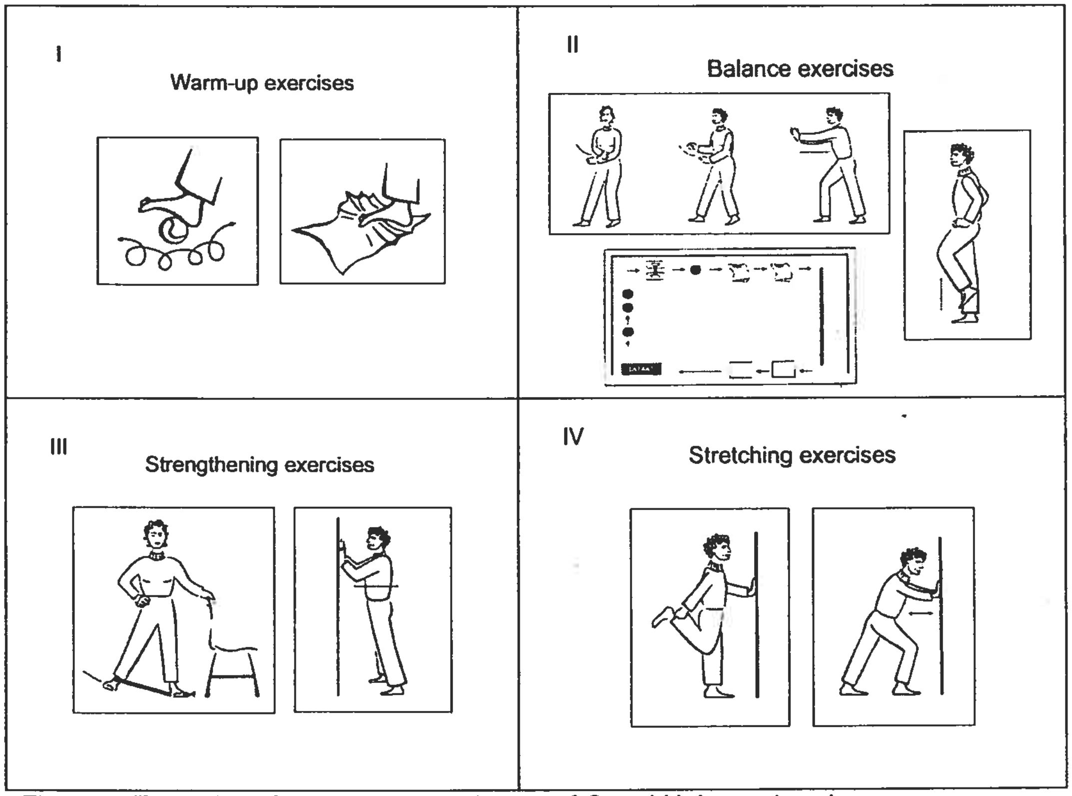


Figure 1. Examples of exercises at each step of *Stand Up!* exercise classes (I – Exercises to stimulate ankle and foot proprioception and flexibility; II – Movement inspired from Tai Chi, exercise to improve one-leg stance and overview of an obstacle course including objects to step over and a line marked on the floor to practice tandem walking; III – Exercise with Theraband® and a *push-up* exercise adapted for the upright position; IV – Stretching exercises for quadriceps and calf muscles). Adapted from Trickey et al. (2003).[34]

Table 1. Participants' Profile at Baseline in the Full Study Sample and in the Control and Experimental Groups

Variables	Full Study Sample (n =197) Mean (SD) or %	Control Participants (n = 101) Mean (SD) or %	Experimental Participants (n = 96) Mean (SD) or %
Demographic, Falls, and Health Characteristics:			
Age	73.9 (7.4)	74.1 (7.4)	73.7 (7.4)
Sex (Female)	84.3	84.2	84.4
Living Conditions (Living Alone)	57.4	59.4	55.2
Education Level:			
Elementary	24.9	20.8	29.2
High School	43.1	43.6	42.7
College/University	32.0	35.6	28.1
Economic Conditions:			
Poor	7.6	7.9	7.3
Average	67.5	66.3	68.8
Well Off	24.9	25.7	24.0
Falls (1 or Several Falls in the 12 Previous Months)	38.1	37.6	38.5
Perceived Health Status			
Poor	2.0	1.0	3.1
Medium	17.3	11.9	22.9
Good	36.5	39.6	33.3
Very Good	28.9	34.7	22.9
Excellent	15.2	12.9	17.7
Medication Use (1 or Several Medications Associated with Falls in the 2 Previous Days)	68.0	70.3	65.6
Mental Health (SF-36)	72.7 (19.4)	72.1 (19.6)	73.2 (19.3)
Balance-Related Psychological Factors:			
Balance Confidence	37.6 (7.3)	37.3 (7.8)	37.9 (6.9)
Perceived Balance	6.4 (2.1)	6.4 (2.2)	6.5 (2.0)
Balance Performance Scores:			
Static Balance and Mobility (s)			
One-Leg Stance, eyes open, R	13.2 (16.8)	12.0 (14.7)	14.4 (18.8)
One-Leg Stance, eyes open, L	11.8 (15.9)	12.3 (16.0)	11.4 (15.9)
One-Leg Stance, eyes closed, R	2.6 (2.1)	2.5 (2.2)	2.7 (1.9)
One-Leg Stance, eyes closed, L	2.6 (2.8)	2.6 (2.2)	2.7 (3.4)
Tandem Stance	28.0 (24.1)	28.2 (24.1)	27.9 (24.2)
Tandem Walk	17.4 (10.2)	18.0 (9.6)	16.7 (10.9)
Stability Limits (cm)			
Functional Reach	24.6 (6.7)	24.8 (6.7)	24.4 (6.8)
Lateral Reach, R*	14.2 (4.7)	13.5 (4.0)	14.9 (5.3)
Lateral Reach, L*	13.5 (4.6)	12.8 (4.1)	14.2 (5.0)

Abbreviations: SD = standard deviation; R = right; L = left.
* Mean of experimental and control participants statistically different (Student t test, p = .03).

Table 2. Scores on Balance-Related Psychological Factors at Baseline and Post-Test in Control and Experimental Groups

Balance-Related Psychological Factors	Control Participants		Experimental Participants	
	Baseline	Post-test	Baseline	Post-test
Balance Confidence (mean, SD) (n = 179)	37.3 (7.6)	36.9 (7.9)	37.7 (7.0)	36.2 (7.8)
Perceived Balance (mean, SD) (n = 183)	6.4 (2.2)	5.8 (2.2)	6.5 (2.0)	6.6 (1.7)

Table 3. Results of Linear Regression Models Testing Group Effect on Balance Confidence After Adjustment for a Varying Number of Characteristics

Variables	**Model #1** (Reduced model)	**Model #2** (Model #1 + demo data)	**Model #3** (Model #2 + health data)	**Model #4a** (Model #3 + res Δ One-Leg Stance, O-R	**Model #4b** (Model #3 + res Δ One-Leg Stance, O-L)	**Model #4c** (Model #3 + res Δ One-Leg Stance, C-L)	**Model #4d** (Model #3 + res Δ Tand. Stance)	**Model #4e** (Model #3 + res Δ Tand. Walking)
Baseline Balance Confidence	0.81^{+} (0.05)	0.80^{+} (0.06)	0.79^{+} (0.06)	0.79^{+} (0.06)	0.79^{+} (0.06)	0.79^{+} (0.06)	0.78^{+} (0.06)	0.81^{+} (0.06)
Group (Exp.)	- 0.71 (0.76)	- 0.83 (0.77)	- 0.82 (0.80)	- 0.68 (0.82)	- 0.92 (0.85)	- 0.75 (0.84)	- 1.20 (0.80)	- 1.10 (0.77)
Age		- 0.06 (0.06)	- 0.06 (0.06)	- 0.07 (0.06)	- 0.06 (0.06)	- 0.08 (0.06)	- 0.01 (0.06)	- 0.04 (0.06)
Sex (Female)		0.18 (1.15)	0.40 (1.19)	0.29 (1.20)	0.23 (1.22)	0.33 (1.24)	0.19 (1.18)	0.93 (1.13)
Education (Low. Level)		1.08 (1.07)	1.15 (1.09)	1.08 (1.10)	1.24 (1.11)	1.14 (1.12)	1.29 (1.07)	1.83 (1.02)
Education (Int. Level)		0.67 (0.92)	0.80 (0.95)	0.73 (0.96)	1.00 (1.00)	0.86 (0.99)	1.02 (0.95)	0.29 (0.90)
Economic Conditions (Low. Level)		0.08 (1.73)	0.15 (1.82)	0.21 (1.82)	0.02 (1.84)	0.11 (1.85)	0.45 (1.80)	0.73 (1.68)
Economic Conditions (Int. Level)		- 0.58 (0.93)	- 0.57 (0.96)	- 0.51 (0.96)	- 0.72 (1.00)	- 0.52 (0.99)	- 0.75 (0.95)	- 0.26 (0.89)
Living Condition (Living Alone)		0.77 (0.90)	0.69 (0.92)	0.79 (0.93)	0.53 (0.95)	0.53 (0.96)	0.81 (0.92)	1.17 (0.87)
Falls (1 Fall or More)			0.60 (0.83)	0.50 (0.84)	0.71 (0.86)	0.60 (0.86)	0.67 (0.83)	0.59 (0.79)
Perceived Health (Low. Level)			- 1.05 (1.45)	- 1.11 (1.45)	- 0.90 (1.48)	- 1.05 (1.50)	- 0.85 (1.45)	- 0.70 (1.39)
Perceived Health (Int. Level)			- 0.56 (1.12)	- 0.53 (1.12)	- 0.46 (1.13)	- 0.59 (1.16)	- 0.62 (1.10)	- 0.75 (1.03)
Medication Use			- 0.45 (0.87)	- 0.43 (0.87)	- 0.30 (0.90)	- 0.50 (0.89)	- 0.27 (0.86)	0.45 (0.82)
Mental Health (SF-36)			0.000 (0.02)	- 0.001 (0.02)	0.002 (0.02)	0.004 (0.02)	0.005 (0.02)	0.000 (0.02)
Res Δ Balance Performance				- 0.03 (0.03)	0.03 (0.04)	- 0.03 (0.19)	0.05 (0.03)	- 0.11 (0.05)
Intercept	37.03^{+} (0.53)	41.00^{+} (4.41)	41.58^{+} (4.96)	42.13^{+} (5.00)	41.59^{+} (5.05)	42.53^{+} (5.18)	37.40^{+} (5.23)	38.92^{+} (4.68)

Notes: Values represent unstandardized betas (standard errors) obtained for each model.
R^2 change after addition of group membership in the model = 0.002 (p = 0.35).
* $p < .05$; ‡ $p \leq .01$; $^{+}$ $p < .001$.
Abbreviations: demo = demographic; res Δ = residualized changes; O-R = eyes open, right side; O-L = eyes open, left side; C-L = eyes closed, left side; Tand. = Tandem; Exp. = Experimental; Low. = Lower; Int. = Intermediate.

Table 4. Results of Linear Regression Models Testing Group Effect on Perceived Balance After Adjustment for a Varying Number of Characteristics

Variables	**Model #1** (Reduced model)	**Model #2** (Model #1 + demo data)	**Model #3** (Model #2 + health data)	**Model #4a** (Model #3 + res Δ One-Leg Stance, O-R	**Model #4b** (Model #3 + res Δ One-Leg Stance, O-L)	**Model #4c** (Model #3 + res Δ One-Leg Stance, C-L)	**Model #4d** (Model #3 + res Δ Tand. Stance)	**Model #4e** (Model #3 + res Δ Tand. Walking)
Baseline Perceived Balance	0.38+ (0.07)	0.33+ (0.07)	0.31+ (0.07)	0.31+ (0.07)	0.32+ (0.07)	0.33+ (0.07)	0.32+ (0.07)	0.32+ (0.07)
Group (Exp.)	0.83‡ (0.28)	0.76‡ (0.27)	0.80‡ (0.28)	0.77‡ (0.29)	0.73* (0.30)	0.79‡ (0.30)	0.81‡ (0.29)	0.80‡ (0.30)
Age		- 0.06‡ (0.02)	- 0.06‡ (0.02)	-0.06‡ (0.02)	- 0.06‡ (0.02)	- 0.06‡ (0.02)	- 0.06* (0.02)	-0.06‡ (0.02)
Sex (Female)		0.05 (0.41)	0.13 (0.42)	0.16 (0.43)	0.14 (0.43)	0.10 (0.44)	0.20 (0.42)	0.30 (0.44)
Education (Low. Level)		0.30 (0.38)	0.29 (0.39)	0.31 (0.39)	0.32 (0.39)	0.27 (0.40)	0.31 (0.38)	0.25 (0.40)
Education (Int. Level)		0.06 (0.33)	0.06 (0.34)	0.07 (0.34)	0.12 (0.35)	0.05 (0.35)	0.13 (0.34)	0.04 (0.35)
Economic Conditions (Low. Level)		- 0.99 (0.60)	- 0.99 (0.64)	- 1.00 (0.64)	-1.02 (0.65)	- 0.95 (0.65)	- 0.95 (0.64)	- 0.93 (0.65)
Economic Conditions (Int. Level)		- 0.54 (0.33)	- 0.51 (0.34)	- 0.53 (0.34)	- 0.57 (0.36)	- 0.52 (0.35)	- 0.59 (0.34)	- 0.49 (0.35)
Living Condition (Living Alone)		- 0.24 (0.32)	- 0.28 (0.33)	- 0.30 (0.33)	- 0.29 (0.34)	- 0.27 (0.34)	- 0.30 (0.33)	- 0.24 (0.34)
Falls (1 Fall or More)			- 0.09 (0.30)	- 0.07 (0.30)	- 0.04 (0.31)	- 0.07 (0.31)	- 0.06 (0.30)	- 0.05 (0.31)
Perceived Health (Low. Level)			- 0.61 (0.52)	- 0.60 (0.52)	- 0.57 (0.53)	- 0.56 (0.54)	- 0.65 (0.52)	- 0.70 (0.54)
Perceived Health (Int. Level)			- 0.30 (0.40)	- 0.31 (0.40)	- 0.30 (0.41)	- 0.25 (0.41)	- 0.35 (0.40)	- 0.32 (0.40)
Medication Use			0.03 (0.31)	0.03 (0.31)	0.07 (0.32)	0.05 (0.32)	0.02 (0.31)	0.04 (0.32)
Mental Health (SF-36)			- 0.001 (0.01)	- 0.001 (0.01)	- 0.001 (0.01)	0.0001 (0.01)	- 0.002 (0.01)	- 0.002 (0.01)
Res Δ Balance Performance				0.01 (0.01)	0.01 (0.01)	0.004 (0.07)	0.01 (0.01)	- 0.01 (0.02)
Intercept	5.84+ (0.20)	10.80+ (1.56)	11.21+ (1.77)	11.01+ (1.79)	10.98+ (1.81)	10.87+ (1.86)	10.86+ (1.86)	10.91+ (1.83)

Notes: Values represent unstandardized betas (standard errors) obtained for each model.
R^2 change after addition of group membership in the model = 0.04 ($p < 0.003$).
* p < .05; ‡ p ≤ .01; + p < .001.
Abbreviations: demo = demographic; res Δ = residualized changes; O-R = eyes open, right side; O-L = eyes open, left side; C-L = eyes closed, left side; Tand. = Tandem; Exp. = Experimental; Low. = Lower; Int. = Intermediate.

CHAPITRE 8 – DISCUSSION

Le but général de cette thèse était d'établir le potentiel des programmes communautaires de prévention des chutes (plus spécifiquement ceux comprenant des composantes d'exercices d'équilibre et d'éducation offertes en groupe) pour agir sur les facteurs psychologiques associés aux chutes chez les aînés. Plus précisément, la thèse visait deux objectifs, soit : 1) d'étudier les propriétés psychométriques d'une version simplifiée d'un instrument de mesure conçu pour évaluer la confiance des aînés en leur équilibre (l'échelle ABC-S); et 2) d'évaluer les effets du programme PIED sur deux facteurs psychologiques associés aux chutes chez les aînés vivant à domicile, soit la confiance en son équilibre et l'équilibre perçu. Afin de favoriser le transfert des connaissances issues de ces études, les résultats de la thèse ont été présentés sous forme d'articles.

La pertinence de la thèse tient au fait que les facteurs psychologiques associés aux chutes, tels la peur de chuter, la confiance en son équilibre et le sentiment d'efficacité relative aux chutes sont de plus en plus reconnus comme des facteurs importants à prendre en compte pour évaluer la vulnérabilité des aînés face aux chutes. En effet, quelques études longitudinales montrent que ces facteurs sont des prédicteurs indépendants de chutes (Cumming et al., 2002; Delbaere et al., 2004; Friedman et al., 2003). Des études ont également montré des associations entre ces facteurs et l'autonomie fonctionnelle, de même que la qualité de vie des aînés (Cumming et al., 2000; Delbaere et al., 2004; Lachman et al., 1998; Mendes de Leon et al., 1996). Par conséquent, de plus en plus de chercheurs suggèrent que les interventions de prévention des chutes devraient non seulement viser des facteurs physiques, tels l'équilibre et la force, mais devraient également prendre en considération les facteurs psychologiques associés aux chutes comme cibles d'intervention (Lachman et al., 1998; Tinetti et al., 1994a; Simpson et al., 1998; Simpson et Jones, 2004).

Afin de jauger de l'efficacité des interventions sur les facteurs psychologiques associés aux chutes, les intervenants et les chercheurs doivent avoir recours à des instruments de mesure dont les propriétés psychométriques ont été éprouvées auprès de cette population. C'est dans cette optique que l'étude psychométrique de l'échelle ABC-S a été menée dans le cadre de cette thèse (article 3). Par ailleurs, la recension des écrits révèle qu'une quantité limitée d'études évaluatives ont examiné l'impact des interventions préventives offertes aux aînés sur les facteurs psychologiques associés aux chutes. À cet égard, l'étude évaluative réalisée dans cette thèse répond à un important besoin de données probantes (article 4). Enfin, la thèse a également donné lieu à la rédaction de deux autres articles : l'un portant sur la recension des études ayant examiné l'impact de diverses interventions préventives sur la peur de chuter, la confiance en son équilibre et le sentiment d'efficacité relative aux chutes chez les aînés (article 1); l'autre portant sur la description détaillée de l'intervention spécifique investiguée dans la thèse, soit le programme PIED (article 2). Ce dernier article présente également les résultats d'une analyse de la faisabilité de l'implantation du programme PIED en milieu communautaire.

8.1 Synthèse des écrits sur l'impact des interventions (article 1)

Un nombre croissant de chercheurs s'intéressent à l'impact des interventions destinées aux aînés vivant à domicile sur les facteurs psychologiques associés aux chutes. Toutefois, peu d'efforts de synthèse des résultats de ces études avaient été réalisés jusqu'à maintenant. Une première revue systématique des études ayant examiné l'effet de diverses interventions préventives sur les facteurs psychologiques associés aux chutes a été publiée récemment (Zijlstra et al., 2007b). Toutefois, une limite importante de cette recension a trait au choix des chercheurs de synthétiser les résultats des 19 études examinées en regroupant tous les facteurs psychologiques associés aux chutes en un seul construit général (soit celui de la peur de chuter), en dépit du fait que ces facteurs ne sont pas isomorphes (Jørstad et al., 2005; Li et al., 2002).

Par conséquent, une nouvelle revue systématique des études a été effectuée dans le cadre de cette thèse, en séparant cette fois les résultats des études en fonction de chacun des construits mesurés (peur de chuter, confiance en son équilibre et sentiment d'efficacité relative aux chutes). La recension réalisée a porté sur les résultats de 31 études. Une description détaillée des interventions examinées dans ces études constitue une autre contribution notable de cet article. L'analyse des 31 études a permis de constater une discordance importante entre les construits investigués par les chercheurs et les outils qu'ils choisissent pour les évaluer. En effet, nous avons pu noter dans une dizaine d'études que les chercheurs avaient eu recours à des échelles mesurant des construits comme le sentiment d'efficacité personnelle relative aux chutes ou la confiance en son équilibre, alors qu'ils souhaitaient investiguer l'impact d'une intervention sur la peur de chuter.

En termes de résultats, la revue systématique a relevé des données probantes quant aux bienfaits du Tai Chi pour réduire la peur de chuter, ainsi qu'améliorer la confiance en son équilibre et le sentiment d'efficacité relative aux chutes. Il semble aussi que les interventions multifactorielles à domicile combinant exercices et stratégies d'éducation ont un impact positif sur le sentiment d'efficacité relative aux chutes. Enfin, la recension indique que les exercices individualisés offerts à domicile comprenant une composante d'équilibre peuvent avoir un impact positif sur la peur de chuter et le sentiment d'efficacité relative aux chutes. Toutefois, d'autres études s'avèrent nécessaires pour pouvoir tirer des conclusions quant à l'impact psychologique des interventions communautaires comprenant des exercices d'équilibre réalisés en groupe, autres que le Tai Chi. L'étude évaluative réalisée dans cette thèse répond précisément à un tel besoin.

8.2 Description détaillée du programme PIED et analyse de la faisabilité de son implantation (article 2)

Les interventions en promotion de la santé telles que les programmes de prévention des chutes s'avèrent souvent des ensembles complexes comportant plusieurs composantes (Herbert et Bø, 2005). Pour faciliter la synthèse des connaissances issues des recherches, il est crucial de fournir suffisamment de détails sur le contenu de l'intervention étudiée et la façon dont celle-ci est offerte (Richard et al., sous presse). Dans cette perspective, un article de la thèse a été dédié à la description du programme PIED. L'article décrit également la façon dont le programme a été offert dans le cadre de l'étude principale. Cet article se veut complémentaire aux articles rapportant les résultats des études ayant examiné les effets du programme PIED sur l'équilibre (Robitaille et al., 2005), sur les chutes (Robitaille, Gauvin, Laforest, Fournier, Corriveau et Filiatrault, en préparation), sur le maintien de l'engagement dans des activités physiques suite au programme (Laforest, Pelletier, Gauvin, Robitaille, Fournier, Corriveau et Filiatrault, soumis), de même que sur les facteurs psychologiques associés aux chutes (Filiatrault et al., sous presse).

En plus de décrire l'intervention, l'article présente les résultats d'une analyse de la faisabilité d'une implantation du programme dans les milieux communautaires. L'analyse révèle qu'en dépit d'une certaine hétérogénéité, les organismes du milieu communautaire sont aptes à recruter la population cible du programme PIED et à offrir le programme selon ses lignes directrices. De plus, les organismes réussissent à assurer des taux de participation et d'observance suffisants pour induire des résultats significatifs en termes d'équilibre, l'un des principaux facteurs modifiables du risque de chutes chez les aînés. Ces données suggèrent que le programme peut être implanté avec succès dans les milieux communautaires.

Le contenu de cet article est essentiel pour informer les chercheurs quant à la possibilité de généraliser les résultats de l'étude sur l'efficacité du programme PIED à la population âgée et pour guider les intervenants, les gestionnaires et les décideurs dans la sélection de programmes de promotion de la santé à offrir à la population âgée.

8.3 Étude des propriétés psychométriques d'une version simplifiée de l'échelle ABC (article 3)

Plusieurs outils sont disponibles pour évaluer les facteurs psychologiques associés aux chutes chez les aînés. Toutefois, l'échelle ABC (ou *ABC Scale*) s'avère un outil particulièrement adapté à la population de l'étude, soit des aînés autonomes susceptibles de présenter un haut niveau de fonctionnement. En effet, les items de cet outil représentent des niveaux de difficulté variés. Par conséquent, cet outil est moins sujet à l'effet plafond observé avec un autre outil fréquemment utilisé auprès des aînés pour évaluer leur sentiment d'efficacité relative aux chutes (i.e., le FES). De plus, plusieurs études témoignent de la validité, de la fidélité test-retest et de la consistance interne de l'échelle ABC (Jørstadt et al., 2005; Myers et al., 1996; Powell et Myers, 1995). Toutefois, l'utilisation de l'outil auprès d'un groupe d'aînés a conduit à l'identification de certaines lacunes, soit d'une part, un manque de convivialité dans la question de départ et l'échelle de réponses et, d'autre part, le manque de consistance d'un item avec les messages véhiculés par la santé publique en matière de prévention des chutes. Ces lacunes ont conduit au développement d'une version simplifiée de l'outil laquelle a fait l'objet d'une étude psychométrique dans le cadre de cette thèse.

L'étude psychométrique a permis de constater que la version simplifiée de l'échelle ABC (échelle ABC-S) présentait une bonne consistance interne et une bonne validité concomitante avec plusieurs variables telles que la peur de chuter, l'histoire de chutes, l'équilibre perçu et la performance des aînés à une série d'épreuves d'équilibre. En plus de fournir un indicateur global de la confiance en son équilibre (compilé par la simple addition des scores obtenus pour chacun des items), l'outil donne des informations aux intervenants quant aux tâches spécifiques pour lesquelles les aînés se sentent peu ou pas confiants. Ces informations reliées au quotidien peuvent guider les intervenants dans le choix de stratégies d'interventions adaptées pour promouvoir une plus grande confiance en son équilibre chez les aînés. Par ailleurs, il est utile de noter que la réalisation de l'étude psychométrique a impliqué le recours à des méthodes novatrices à des fins d'évaluation des propriétés psychométriques de l'outil, à savoir les analyses multiniveaux appliquées aux méthodes proposées par la théorie des réponses aux items. Ceci a permis de réaliser une analyse mieux adaptée à l'échelle de réponses de l'outil, tout en permettant une utilisation maximale des réponses colligées pour chacun des items de l'outil. De plus, ces méthodes ont permis de déterminer la hiérarchie des items de l'outil. Compte tenu des qualités psychométriques de l'outil et du construit mesuré, l'échelle ABC-S apparaît tout à fait indiquée pour évaluer l'efficacité des programmes de prévention des chutes comportant une composante d'exercices visant à améliorer l'équilibre des aînés, tel que le programme PIED.

8.4 Étude de l'impact d'un programme communautaire de prévention des chutes (article 4)

Les résultats de l'étude évaluative montrent que le programme PIED contribue à améliorer l'équilibre perçu des participants. Ces résultats concordent avec ceux publiés par Robitaille et collaborateurs (2005) relatifs aux effets positifs du programme sur l'équilibre des participants. Ceci indique que les participants sont aptes à percevoir les bienfaits du programme sur leur équilibre. Toutefois, aucun impact n'a été noté dans la confiance des aînés en leur équilibre. Ces résultats apparaissent surprenants à première vue puisque des études montrent une association significative entre la confiance en son équilibre et l'équilibre (Filiatrault et al., 2007a; Hatch et al., 2003; Myers et al., 1996). Plusieurs explications possibles ont été proposées pour élucider l'absence d'effet du programme sur la confiance en son équilibre : 1) la confiance en son équilibre a d'autres déterminants que l'équilibre objectif lesquels ne sont pas directement ciblés par le programme (ex.: anxiété); 2) la durée du programme (i.e., 12 semaines) n'est pas suffisamment longue pour permettre aux participants de développer leur sentiment de contrôle face à leur capacité de maintenir leur équilibre dans le quotidien; 3) l'effet positif du programme est atténué par un effet négatif de la composante éducative du programme; 4) le volume d'exercices reliés au fonctionnement quotidien des aînés est insuffisant dans le programme; et 5) en plus d'avoir contribué à augmenter l'équilibre des aînés, le programme s'accompagne d'une exposition accrue à des situations où les aînés sont à risque de perdre l'équilibre et de tomber, de par un plus grand niveau d'activité, ce qui contribue à limiter les gains dans la confiance en son équilibre.

Des études qui permettraient de vérifier les diverses explications évoquées précédemment seraient fort utiles pour permettre de mieux comprendre les mécanismes par lesquels il est possible d'agir sur la confiance en son équilibre. Les résultats de tels efforts de recherche pourraient certes permettre d'améliorer le programme PIED, et d'autres programmes semblables, afin d'optimiser les bienfaits de l'intervention tant en termes physiques que psychologiques.

L'étude évaluative a également permis de constater que l'ampleur des changements dans l'équilibre des aînés suite à l'intervention n'était pas associée aux changements dans les facteurs psychologiques associés aux chutes. Ces résultats indiquent qu'en dépit de leur association, l'équilibre et les facteurs psychologiques associés aux chutes ne changent pas de façon similaire. Ceci suggère, qu'en plus d'un changement dans l'équilibre, d'autres facteurs sont requis pour observer un changement correspondant en termes de confiance en son équilibre ou d'équilibre perçu.

8.5 Contributions significatives de la thèse

La présente thèse a une portée à la fois sur les plans scientifique et pratique. Sur un plan scientifique, le champ d'investigation de la prévention des chutes bénéficiera de l'éclairage nouveau que cette thèse porte sur les concepts psychologiques associés aux chutes et sur les possibilités d'agir sur ceux-ci par des interventions communautaires de prévention des chutes. La thèse soutient l'idée que la peur de chuter, la confiance en son équilibre et le sentiment d'efficacité relative aux chutes sont des construits distincts bien que reliés entre eux. Des distinctions entre les trois construits ont été identifiées dans la recension des écrits. De plus, quelques études évaluatives recensées dans la revue systématique ont montré des effets positifs d'une intervention sur un construit sans pour autant noter des effets sur un autre. La thèse a aussi permis de constater que, malgré ces nuances, les construits psychologiques associés aux chutes étaient bien souvent utilisés de façon interchangeable et que certains outils conçus pour mesurer un construit étaient fréquemment utilisés pour en mesurer un autre.

La thèse invite donc les chercheurs, tout comme les intervenants, à la prudence dans la terminologie utilisée et dans le choix d'instruments de mesure.

En ce qui a trait à l'intervention, la thèse indique qu'un programme communautaire comportant des composantes d'exercices d'équilibre et d'éducation offertes en groupe et ayant montré ses bienfaits sur l'équilibre des aînés, a également des effets positifs sur l'équilibre perçu des participants. Toutefois, cet impact ne se traduit pas par une confiance accrue des participants en leur équilibre. Ceci suggère qu'un changement dans la confiance en son équilibre nécessite une action sur d'autres facteurs que l'équilibre et/ou que le programme nécessite des amendements en termes de durée, de type ou de volume d'exercices. Par ailleurs, l'impact spécifique de la composante éducative du programme PIED sur la confiance en son équilibre mériterait d'être examiné en soi. Puisque cette composante sensibilise les aînés aux risques de chutes, on ne peut exclure un effet potentiellement négatif des capsules de prévention sur la confiance en son équilibre qui pourrait venir atténuer un effet bénéfique des exercices sur ce même facteur. Il serait également pertinent d'examiner si l'effet positif du programme sur l'équilibre des aînés s'accompagne également d'une exposition accrue à des situations où les aînés sont à risque de perdre l'équilibre et de tomber, de par un plus grand niveau d'activité, ce qui pourrait contribuer à limiter les gains dans la confiance en son équilibre.

Une autre contribution scientifique importante de la thèse tient au fait qu'elle a permis la validation d'une version plus conviviale d'un outil permettant d'évaluer la confiance des aînés en leur équilibre. Ce questionnaire est simple à utiliser et offre aux intervenants un score global reflétant la confiance des participants en leur équilibre, de même que des informations sur la nature des tâches qui posent problème. De plus, la validation de l'outil a été réalisée en ayant recours à des méthodes novatrices et rigoureuses, soit les analyses multiniveaux appliquées aux méthodes issues de la théorie des réponses aux items.

Enfin, deux autres contributions significatives de la thèse sont associées à la démarche entreprise. Une première contribution a été de réaliser une revue systématique des études ayant examiné l'impact des interventions préventives offertes aux aînés sur les facteurs psychologiques associés aux chutes. Cette revue a donné lieu à une décomposition de plus d'une quarantaine d'interventions en termes de stratégies, de contenu et de processus. Les tableaux synthèse élaborés dans le cadre de cette recension s'avèreront certes utiles pour les intervenants désirant sélectionner des interventions susceptibles d'avoir un impact sur les facteurs psychologiques associés aux chutes et qui soient adaptées à leur milieu de pratique. Cette revue fait également le point sur l'orientation à prendre pour de futurs travaux de recherche et sur certaines limites méthodologiques dans les études recensées.

Enfin, la thèse fournit une description détaillée d'un programme de prévention des chutes applicable en milieu communautaire et ayant une efficacité démontrée sur l'équilibre et sur un facteur psychologique associé aux chutes. Cette description sera certes utile pour les intervenants désireux d'implanter cette intervention et pour les chercheurs intéressés par la recherche évaluative en prévention des chutes.

8.6 Points forts et limites de la thèse

En s'arrimant à une étude évaluative dans un domaine prioritaire pour la santé publique, soit celui de la prévention des chutes chez les aînés, la présente thèse contribue à accroître la portée scientifique et pratique des données colligées auprès de 200 aînés dans le cadre du projet de recherche principal. La thèse permet du même coup une optimisation des ressources humaines (agents de recherche, interviewers, physiothérapeutes,…) et matérielles engagées pour la réalisation de l'étude principale. Elle s'inscrit également dans les recommandations récentes émises par un certain nombre de chercheurs quant à la nécessité d'avoir recours à des devis de recherche autres que les essais randomisés pour pouvoir documenter l'effet des interventions de santé publique dans des conditions naturelles. En effet, selon Glasgow et collaborateurs (2003), ainsi que Victora et son équipe (2004), les essais randomisés ne sont pas ceux qui assurent le meilleur transfert des connaissances issues des recherches dans la pratique en santé publique. Toutefois, la contrepartie de ce point positif est que le recours à un devis quasi expérimental n'exclut pas complètement la possibilité que les participants des groupes expérimentaux et des groupes témoins aient été différents sur des variables non mesurées/non contrôlées par les analyses. Par ailleurs, une autre limite de la thèse a trait à l'absence de données quant à la sensibilité au changement des deux échelles utilisées pour mesurer les facteurs psychologiques associés aux chutes, soit la confiance en son équilibre et l'équilibre perçu.

Enfin, comme pour toute analyse de données secondaires, une limite de la thèse est le manque de contrôle sur le choix des variables à inclure dans l'étude et sur la façon dont l'information a été colligée et codifiée (Jacobson, Hamilton et Galloway, 1993). À titre d'exemple, des données ont été colligées sur la peur de chuter dans le cadre de l'étude principale. Toutefois, la variable « peur de chuter » a été évaluée à l'aide d'une simple question « Avez-vous peur de chuter ? » et d'une échelle catégorielle à 4 degrés. Tel que mentionné au chapitre 2, l'évaluation de la peur de chuter à l'aide d'une telle question présente un certain nombre de limites, notamment des biais de mesure. Ceci explique que nous n'ayons pas retenu cette mesure dans le cadre de l'étude évaluative. Dans le futur, d'autres méthodes comportant moins de limites pourraient être utilisées pour évaluer la peur de chuter chez les aînés. Il existe par exemple des instruments permettant d'évaluer la peur de chuter à l'aide de plusieurs items ou à l'aide de termes moins chargés sur le plan affectif (ex. : « être préoccupé par les chutes » plutôt « qu'avoir peur de chuter ») (Lachman et al., 1998; Yardley et al., 2005).

8.7 Pistes de recherche futures

Les recherches évaluatives examinant les effets des interventions sur les facteurs psychologiques associés aux chutes chez les aînés s'avèrent cruciales puisque ces facteurs peuvent influencer l'incidence de chutes, le fonctionnement quotidien et la qualité de vie des aînés. Les interventions multifactorielles comportant notamment une composante d'exercices sont essentielles à documenter puisqu'elles figurent parmi les stratégies recommandées pour améliorer l'équilibre et réduire les chutes chez les aînés vivant à domicile (Gillepsie et al., 2003). Toutefois, ce type d'interventions pose un défi important aux chercheurs puisqu'il s'avère impossible de déterminer les effets indépendants de chacune des composantes (Barnett et al., 2003). À cet égard, une évaluation distincte des composantes d'exercices et éducatives du programme PIED serait utile (Feder, Cryer, Donovan et Carter, 2000) car elle permettrait de déterminer l'impact de chacune des composantes sur les facteurs psychologiques associés aux chutes et d'examiner si ces composantes agissent de façon synergique ou antagoniste. Outre cette piste de recherche, l'étude d'impact réalisée dans le cadre de cette thèse met en relief une série d'explications pouvant justifier l'absence d'impact du programme PIED sur la confiance en son équilibre. Ces explications sont autant de pistes à investiguer dans les recherches futures.

Il serait également pertinent de documenter l'effet du programme PIED sur d'autres construits psychologiques associés aux chutes tels la peur de chuter et le sentiment d'efficacité relative aux chutes. Puisque la composante éducative du programme PIED comprend des discussions avec les participants au sujet d'un éventail de stratégies concrètes pour réduire les risques de chutes dans son domicile et dans la communauté, il est possible que le sentiment d'efficacité relative aux chutes se soit amélioré chez les participants à la suite du programme. De plus, la composante éducative du programme est une occasion pour les aînés de s'entraider les uns les autres et de partager des expériences. Il est possible que le soutien social reçu dans le cadre du programme procure également des bienfaits aux participants et qu'il ait ainsi une influence positive sur les facteurs psychologiques associés aux chutes.

De façon plus large, il serait souhaitable que des chercheurs se penchent sur la signification clinique des changements observés dans les facteurs psychologiques suite à des interventions. Ceci pourrait être réalisé en examinant l'impact des interventions sur la restriction d'activités associée à la peur de chuter ou à une faible confiance en son équilibre. À cet égard, on peut noter que la littérature relative à la prévention des chutes semble avoir mis l'accent sur l'idée que la peur de chuter, ou alternativement, une faible confiance en son équilibre ou en sa capacité d'éviter une chute, soient d'emblée des aspects négatifs. Bien que la peur de chuter et une faible confiance en son équilibre puissent être néfastes si elles incitent la personne à restreindre, voire éviter des activités qu'elle a les capacités de réaliser, il faut reconnaître que ces facteurs peuvent également comporter une dimension protectrice favorable lorsque la personne fait face à des situations représentant un risque réel. Des études futures considérant à la fois les pôles positif et négatif des facteurs psychologiques associés aux chutes seraient les bienvenues pour faire avancer ce domaine de recherche.

CHAPITRE 9 – CONCLUSION

L'incidence et les conséquences des chutes chez les aînés, jumelées au vieillissement de la population, font de la prévention des chutes un enjeu prioritaire pour la santé publique (MSSS, 2003a). De nombreuses initiatives ont été élaborées pour prévenir les chutes chez les aînés vivant à domicile. Bien que nous disposons de données probantes attestant de l'efficacité de certains programmes de prévention pour améliorer l'équilibre et réduire l'incidence des chutes, lesquels soutiennent leur mise en place par la santé publique (Marks et Allegante, 2004), il s'avère crucial de poursuivre la recherche en ce domaine afin de s'assurer que les programmes offerts procurent un maximum de bienfaits aux aînés et ce, tant aux plans physique que psychologique. Cette thèse s'inscrit résolument dans une telle perspective par une avancée des connaissances sur l'évaluation de l'impact d'un programme de prévention comprenant à la fois des exercices et un volet éducatif offerts en groupe sur des facteurs psychologiques associés aux chutes. Les résultats des travaux de recherche issus de cette thèse, touchant à la fois la mesure et l'évaluation de programmes dans un domaine en plein essor et des plus pertinents pour la santé publique, seront certes significatifs pour éclairer les travaux de recherche futurs et améliorer les interventions offertes aux aînés.

BIBLIOGRAPHIE

Agence de santé publique du Canada (2005). *Rapport sur les chutes des aînés au Canada*. Ottawa, ON: Agence de santé publique du Canada, Division du vieillissement et des aînés.

American College of Sports Medicine (2000). *ACSM's guidelines for exercise testing and prescription*. 6th ed. Philadelphia, PA: Lippincott, Williams & Wilkins.

American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention (2001). Guideline for the prevention of falls in older persons. *Journal of the American Geriatrics Society, 49*, 664-672.

Arai, T., Obuchi, S., Inaba, Y., Nagasawa, H., Shiba, Y., Watanabe, S., Kimura, K., & Kojima, M. (2007). The effects of short-term exercise intervention on falls self-efficacy and the relationship between changes in physical function and falls self-efficacy in Japanese older people. A randomized controlled trial. *American Journal of Physical Medicine and Rehabilitation*, *86*(2), 133-141.

Arfken, C.L., Lach, H.W., & Birge, S.J. (1994). The prevalence and correlates of fear of falling in elderly persons living in the community. *American Journal of Public Health, 84*, 565-570.

Baloh, R.W., Fife, T.D., Zwerling, L., Socotch, T., Jacobson, K., Bell, T., & Beykirch, K. (1994). Comparison of static and dynamic posturography in young and older normal people. *Journal of the American Geriatrics Society, 42*(4), 405-412.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review, 84*, 191-215.

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

Barnett, A., Smith, B., Lord, S.R., Williams, M., & Baumand, A. (2003). Community-based group exercise improves balance and reduces falls in at-risk older people: A randomised controlled trial. *Age and Ageing, 32*(4), 407-414.

Berg, K.O., Wood-Dauphinee, S.L., Williams, J.I., & Gayton, D. (1989). Measuring balance in the elderly: Preliminary development of an instrument. *Physiotherapy Canada, 41*, 304-311.

Berg, K.O., & Kairy, D. (2002). Balance interventions to prevent falls. *Generations, 26*(4), 75-78.

Bertakis, K.D., Azari, R., Helms, L.J., Callahan, E.J., & Robbins, J.A. (2000). Gender differences in the utilization of health care services. *Journal of Family Practice, 49*, 147-152.

Bezon, J., Echevarria, K.H., & Smith, G.B. (1999). Nursing home outcome indicator: Preventing falls for elderly people. *Outcome Management for Nursing Practice, 3*(3), 112-116.

Bhala, R., O'Donnel, J., & Thoppil, E. (1982). Phobic fear of falling and its clinical management. *Physical Therapy, 62*, 187-190.

Botner, E.M., Miller, W.C., & Eng, J.J. (2005). Measurement properties of the Activities-specific Balance Confidence Scale among individuals with stroke. *Disability and Rehabilitation, 27*(4), 156-163.

Brauer, S., Burns, Y., & Galley, P. (1999). Lateral reach: A clinical measure of medio-lateral postural stability. *Physiotherapy Research International, 4*(2), 81-88.

Brouwer, B.J., Walker, C., Rydahl, S.J., Culham, E.G. (2003). Reducing fear of falling in seniors through education and activity programs: A randomized trial. *Journal of the American Geriatrics Society, 51*, 829-834.

Bruce, D.G., Devine, A., & Prince, R.L. (2002). Recreational physical activity levels in healthy older women: The importance of fear of falling. *Journal of the American Geriatrics Society, 50*, 84-89.

Buchner, D.M., Hornbrook, M.C., Kutner, N.G., Tinetti, M.E., Ory, M.G., Mulrow, C.D., Schechtman, K.B., Gerety, M.B., Fiatarone, M.A., & Wolf, S.L. (1993). Development of the Common Data Base for the FICSIT trials. *Journal of the American Geriatrics Society, 41*, 297-308.

Bulajic-Kopjar, M. (2006). Seasonal variations in incidence of fractures among elderly people. *Injury Prevention, 6*, 16-19.

Cameron, I.D., Stafford, B., Cumming, R.G., Birks, C., Kurrle, S.E., Lockwood, K., Quine, S., Finnegan, T., & Salkeld, G. (2000). Hip protectors improve falls self-efficacy. *Age and Ageing, 29*, 57-62.

Campbell, A.J., Robertson, M.C., Gardner, M.M., Norton, R.N., & Tilyard, M.W., & Buchner, D.M. (1997). Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women. *British Medical Journal, 315*, 1065-1069.

Centers for Disease Control and Prevention (2000). *U.S. Fall Prevention Programs for Seniors. Selected programs using home assessment and modification.* Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention.

Chang, J.T., Morton, S.C., Rubenstein, L.Z., Mojica, W.A., Maglione, M., Suttorp, M.J., Roth, E.A., & Shekelle, P.G. (2004). Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomized clinical trials. *British Medical Journal, 328*, 680-683.

Clemson, L., Cumming, R.C., Kendig, H., Swann, M., Heard, R., & Taylor, K. (2004). The effectiveness of a community-based program for reducing the incidence of falls in the elderly: A randomized trial. *Journal of the American Geriatrics Society, 52*, 1487-1494.

Close, J.C.T. (2005). Prevention of falls – a time to translate evidence into practice. *Age and Ageing, 34*, 98-100.

Comité fédéral/provincial/territorial des hauts fonctionnaires – Aînés (1999). *Améliorer la sécurité des aînés du Canada : L'établissement d'un cadre d'action*. Ottawa, ON: Canada, Ministre des travaux publics et des services gouvernementaux.

Cumming, R.G., Salkeld, G., Thomas, M., & Szonyi, G. (2000). Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. *Journal of Gerontology: Medical Sciences, 55A*, 299-305.

Day, L., Fildes, B., Gordon, I., Fitzharris, M., Flamer, H., & Lord, S. (2002). Randomised factorial trial of falls prevention among older people living in their own homes. *British Medical Journal, 325*(7356), 128-131.

DeBoeck, P., & Wilson, M. (2004). *Explanatory item response models: A generalized linear and nonlinear approach*. New York: Springer.

Delbaere, K., Crombez, G., Vanderstraeten, G., Willems, T., & Cambier, D. (2004). Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. *Age and Ageing, 26*, 1-6.

Delbaere, K., Bourgois, J., van den Noortgate, N., Vanderstraeten, G., Willems, T., & Cambier, D. (2006). A home-based multidimensional exercise program reduced physical impairment and fear of falling. *Acta Clinica Belgica, 61*(6), 340-350.

Des Jarlais, D.C., Lyles, C., & Crepaz, N. (2004). Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. *American Journal of Public Health, 94*(3), 361-366.

Devereux, K., Robertson, D., & Briffa, N.K. (2005). Effects of a water-based program on women 65 years and over: A randomised controlled trial. *Australian Journal of Physiotherapy, 51*, 102-108.

Direction générale de la santé publique (2004). *La prévention des chutes dans un continuum de services. Cadre de référence*. Québec, QC: Ministère de la Santé et des Services sociaux.

Dishman, R.K. (1994). *Advances in exercise adherence.* Champaign, IL: Human Kinetics Publishers.

Downton, J.H., & Andrews, K. (1990). Postural disturbance and psychological symptoms amongst elderly people living at home. *International Journal of Geriatrics Psychiatry, 5*(2), 93-98.

Duncan, P.W., Weiner, D.K., Chandler, J., & Studenski, S. (1990). Functional reach: a new clinical measure of balance. *Journal of Gerontology: Medical Sciences, 45A*(6), 192-197.

Duncan, P.W., Chandler, J., Studenski, S., Hughes, M., & Prescott, B. (1993). How do physiological components of balance affect mobility on elderly men? *Archives of Physical Medicine and Rehabilitation, 74*, 1343-1349.

Ebrahim, S., Thompson, P.W., Baskaran, V., & Evans, K. (1997). Randomized placebo-controlled trial of brisk walking in the prevention of postmenopausal osteoporosis. *Age and Ageing, 26*, 253-260.

Evitt, C.P., & Quigley, P.A. (2004). Fear of falling in older adults: A guide to its prevalence, risk factors, and consequences. *Rehabilitation Nursing, 29*(6), 207-210.

Feder, G., Cryer, C., Donovan, S., & Carter, Y. (2000). Guidelines for the prevention of falls in people over 65. *British Medical Journal, 321*, 1007-1011.

Filiatrault, J., Robitaille, Y., Gauvin, L., Laforest, S., Parisien, M., Fournier, M., & Richard, L. (2004). L'auto-évaluation de l'équilibre : Utile en prévention des chutes? *Recueil des résumés de communications de la Conférence internationale « Vers une nouvelle perspective : du vieillir au bien-vieillir »*, p. 49.

Filiatrault, J., Robitaille, Y., Gauvin, L., Laforest, S., Fournier, M., Parisien, M., Corriveau, H., & Richard, L. (2006). Garder PIED sans augmenter sa peur de chuter! *Canadian Journal of Occupational Therapy – Conference Program Supplement*, p. 43.

Filiatrault, J., Gauvin, L., Fournier, M., Parisien, L., Laforest, S., Robitaille, Y., Corriveau, H., & Richard, L. (2007a). Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors. *Archives of Physical Medicine and Rehabilitation, 88*(5), 664-872.

Filiatrault, J., Parisien, M., Laforest, S., Genest, C., Gauvin, L., Fournier, M., Trickey, F., & Robitaille, Y. (2007b). Implementing a community-based falls prevention program: From drawing board to reality. *Canadian Journal on Aging, 26*(3), 213-225.

Filiatrault, J., Gauvin, L., Robitaille, Y., Laforest, S., Corriveau, H., & Richard, L. (sous presse). Impact of a multifaceted community-based falls prevention program on balance-related psychological factors. *Archives of Physical Medicine and Rehabilitation.*

Filiatrault, J., Gauvin, L., Laforest, S., Robitaille, Y., Richard, L., Corriveau, H. (soumis). The impact of preventive interventions offered to community-dwelling seniors on falls-related psychological factors: a review. Soumis à la revue *Preventive Medicine.*

Fletcher, P.C., & Hirdes, J.P. (2004). Restriction in activity associated with fear of falling among community-based seniors using home care services. *Age and Ageing, 33*, 272-279.

Franchignoni, F., Tesio, L., Martino, M.T., & Ricupero, C. (1998). Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. *Aging Clinical Experimental Research, 10*, 26-31.

Friedman, S.M., Munoz, B., West, S.K., Rubin, G.S., & Fried, L.P. (2002). Falls and fear of falling: Which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. *Journal of the American Geriatrics Society, 50*, 1329-1335.

Gagnon, N., & Flint, A.J. (2003). Fear of falling in the elderly. *Geriatrics & Aging, 6*(7), 15-17.

Gagnon, N., Flint, A.J., Naglie, G., & Devins, G.M. (2005). Affective correlates of fear of falling in elderly persons. *American Journal of Geriatric Psychiatry, 13*, 7-14.

Gallagher, E.M., & Howard, B. (1996). Head over heels: Impact of a health promotion program to reduce falls in the elderly. *Canadian Journal on Aging, 15*, 84-96.

Gardner, M.M., Robertson, M.C., & Campbell, A.J. (2000). Exercise in preventing falls and fall related injuries in older people: A review of randomised controlled trials. *British Journal of Sports Medicine, 34*(1), 7-17.

Gehlson, G.M., & Whaley, M.H. (1990). Falls in the elderly: Part II – Balance, strength and flexibility. *Archives of Physical Medicine and Rehabilitation, 71*, 739-741.

Gillespie, L.D., Gillespie, W.J., Robertson, M.C., Lamb, S.E., Cumming, R.G., & Rowe, B.H. (2003). Interventions for preventing falls in elderly people. *The Cochrane Database of Systematic Reviews, 4*, CD000340.

Gitlin, L.N., Winter, L., Dennis, M.P., Corcoran, M., Schinfeld, S., & Hauck, W.W. (2006). A randomized trial of a multicomponent home intervention to reduce functional difficulties in older adults. *Journal of the American Geriatrics Society, 54*, 809-816.

Glasgow, R.E., Lichtenstein, E., & Marcus, A.C. (2003). Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *American Journal of Public Health, 93*(8), 1261-1267.

Green, L., & Kreuter, M.W. (2005). *Health promotion planning. An educational and ecological approach.* (4th ed.) New York, NY: McGraw-Hill.

Hamel, M.F., & Lajoie, Y. (2005). Mental imagery. Effects on static balance and attentional demands of the elderly. *Aging Clinical and Experimental Research, 17*, 223-228.

Hatch, J., Gill-Body, K.M., & Prtney, L.G. (2003). Determinants of balance confidence in community-dwelling elderly people. *Physical Therapy, 83*(12), 1072-1079.

Heitman, D.K., Gossman, M.R., Shaddeau, S.A., & Jackson, J.R. (1989). Balance performance and step width in non institutionalized elderly female fallers and non fallers. *Physical Therapy, 69*, 923-931.

Herbert, R.D., & Bø, K. (2005). Analysis of quality of interventions in systematic reviews. *British Medical Journal, 331*, 507-509.

Hill, K.D., Schwarz, J.A., Kalogeropoulos, A.J., & Gibson, S.J. (1996). Fear of falling revisited. *Archives of Physical Medicine and Rehabilitation, 77*, 1025-1029.

Hinman, M.R. (2002). Comparison of two short-term balance training programs for community-dwelling older adults. *Journal of Geriatric Physical Therapy, 25*, 10-15.

Howland, J., Peterson, E.W., Levin, W.C., Fried, L., Pordon, D., & Bak, S. (1993). Fear of falling among the community-dwelling elderly. *Journal of Aging and Health, 5*(2), 229-243.

Howland, J., Lachman, M.E., & Peterson, E.W. (1998). Covariates of fear of falling and associated activity curtailment. *Gerontologist, 38*, 549-555.

Hsu, P., & Miller, W.C. (2006). Reliability of the Chinese version of the Activities-specific Balance Confidence Scale. *Disability and Rehabilitation, 28*(20), 1287-1292.

Huang, T.-T., & Acton, G.J. (2004). Effectiveness of home visit falls prevention strategy for Taiwanese community-dwelling elders: randomized trial. *Public Health Nursing, 21*, 247-256.

Institut canadien d'information sur la santé [ICIS] (2002). *Coûts hospitaliers des admissions en raison de traumatismes, Canada 2000-2001* [En ligne]. Toronto, ON: Institut canadien d'information sur la santé, 2002, p. 7. http://secure.cihi.ca/cihiweb/fr/downloads/bl_ntraug2002_f.pdf (page consultée le 19 août 2005).

Institut de la statistique du Québec [ISQ] (2000). *Enquête sociale et de santé 1998*. Québec, QC : Gouvernement du Québec.

Institut de la statistique du Québec [ISQ]. (2004). *Si la tendance se maintient... Perspectives démographiques, Québec et régions, 2001-2051*, édition 2003, [En ligne] http://www.stat.gouv.qc.ca/donstat/societe/demographie/persppoplt/pers2001-2051/index.htm (page consultée le 16 juillet 2007).

Institut national de santé publique du Québec [INSPQ] (2006). *Portrait de santé du Québec et de ses régions 2006 : Deuxième rapport national sur l'état de santé de la population du Québec – Les statistiques*. Québec, QC: Gouvernement du Québec.

Jacobson, A.F., Hamilton, P., & Galloway, J. (1993). Obtaining and evaluating data sets for secondary analysis in nursing research. *Western Journal of Nursing Research, 15*(4), 483-494.

Jette, A.M., Harris, B.A., Sleeper, L., Lachman, M.E., Heislein, D., Giorgetti, M., & Levenson, C. (1996). A home-based exercise program for nondisabled older adults. *Journal of the American Geriatrics Society, 44*, 644-649.

Jørstad, E.C., Hauer, K., Becker, C., & Lamb, S.E. (2005). Measuring the psychological outcomes of falling: A systematic review. *Journal of the American Geriatrics Society, 53*, 501-510.

Lach, H.W. (2002). Fear of falling: An emerging public health problem. Generations. *Journal of the American Society on Aging, 26*(4), 33-37.

Lachman, M.E., Howland, J., Tennstedt S, Jette, A., Assmann, S., & Peterson, E.W. (1998). Fear of falling and activity restriction: The Survey of Activities and Fear of Falling in the Elderly (SAFE). *Journal of Gerontology: Psychological Sciences, 53B*(1), 43-50.

Laforest, S., Pelletier, A., Gauvin, L., Fournier, M., Robitaille, Y., & Corriveau, H. (2006). Maintenance of Increased Involvement in Physical Activity among Older Adults Participating in a Community-Based Falls Prevention and Exercise Program. *Congress Program - International Congress on Physical Activity and Public Health*, Atlanta, p. 135.

Laforest, S., Pelletier, A., Gauvin, L., Robitaille, Y., Fournier, M., Corriveau, H., & Filiatrault, J. (soumis). Impact of a community-based falls prevention programme on long-term maintenance of increased involvement in physical activity among older adults: A quasi-experimental design. Soumis à la revue *Journal of Aging and Health.*

Legters K. (2002). Fear of falling. *Physical Therapy, 82*, 264-272.

Leibson, C.L., Tosteson, A.N.A, Gabriel, S.E., Ransom, J.E., & Melton, L.J. (2002). Mortality, disability, and nursing home use for persons with and without hip fracture: a population-based study. *Journal of the American Geriatrics Society, 50*, 1644-1650.

Li, F., McAuley, E., Fisher, K.J., Harmer, P., Chaumaton, N., & Wilson, N.L. (2002). Self-efficacy as a mediator between fear of falling and functional ability in the elderly. *Journal of Aging and Health, 14*(4), 452-466.

Li, F., Fisher, K.J., Harmer, P., McAuley, E., & Wilson, N.L. (2003). Fear of falling in elderly persons: association with falls, functional ability, and quality of life. *Journal of Gerontology: Psychological Sciences, 58B*(5), 283-290.

Li, F., Harmer, P., Fisher, K.J., McAuley, E., Chaumeton, N., Eckstrom, E., Wilson, N.L. (2005). Tai Chi and falls reductions in older adults: a randomized controlled trial. *Journal of Gerontology: Medical Sciences, 60A*(2), 187-194.

Lilley, J.M., Arie, T., & Chilvers, C.E. (1995). Accidents involving older people: A review of the literature. *Age and Ageing, 24*, 346-365.

Lin, M.-R., Wolf, S.L., Hwang, H.-F., & Gong, S.-Y. (2007). A randomized controlled trial of fall prevention programs and quality of life in older fallers. *Journal of the American Geriatrics Society, 55*, 499-506.

Lin, P.-C., & Lu, C.-M. (2005). Hip fracture: family caregivers' burden and related factors for older people in Taiwan. *Journal of Clinical Nursing, 14*, 719-726.

Liu-Ambrose, T., Khan, K.M., Eng, J.J., Lord, S.R., & McKay, H.A, (2004). Balance confidence improves with resistance or agility training. *Gerontology, 50*, 373-382.

Lord, S.R., & Castell, S. (1994). Physical activity program for older persons: Effects on balance, strength, neuromuscular control, and reaction time. *Archives of Physical Medicine and Rehabilitation, 75*, 648-652.

Lusardi, M.M., Smith, E.V. (1997). Development of a scale to assess concern about falling and applications to treatment programs. *Journal of Outcome Measurement, 1*, 34-55.

MacKight, C., & Rockwood, K. (1995). Assessing mobility in elderly people. A review of performance-based measures of balance, gait and mobility for bedside use. *Reviews in Clinical Gerontology, 5*, 464-486.

Marks, R., & Allegrante, J.P. (2004). Falls-prevention programs for older ambulatory community dwellers: From public health research to health promotion policy. *Social and Preventive Medicine, 49*, 171-178.

Mâsse, L.C., Dassa, C., Gauvin, L., Giles-Corti, B., & Motl, R. (2002). Emerging measurement and statistical methods in physical activity research. *American Journal of Preventive Medicine, 23*, 44-55.

Masters, J.R. (1974). Relationship between number of response categories and reliability of Likert-type questionnaires. *Journal of Educational Measurement, 1*, 49-53.

Masud, T., & Morris, R.O. (2001). Epidemiology of falls. *Age and Ageing, 30* (Suppl. 4), 3-7.

McAuley, E., Mihalko, S.L., & Rosenberg, K. (1997). Self-efficacy and balance correlated of fear of falling in the elderly. *Journal of Aging and Physical Activity, 5*, 329-340.

McCormack, G., Lewin, G., McCormack, B., Helmes, E., Rose, E., & Naumann, F. (2004). A pilot study for comparing the influence of different types of exercise intervention on the fear of falling in older adults. *Australasian Journal on Ageing, 23*(3), 131-135.

Mendes de Leon, C.F., Seeman, T.E., Baker, D.I., Richardson, E.D., & Tinetti, M.E. (1996). Self-efficacy, physical decline, and change in functioning in community-living dwellers: A prospective study. *Journal of Gerontology: Social Sciences, 51*, 183-190.

Miller, W.C., Deathe, A.B., & Speechley, M. (2003). Psychometric properties of the Activities-specific Balance Confidence Scale among individuals with a lower-limb amputation. *Archives of Physical Medicine and Rehabilitation, 84*, 656-661.

Ministère de la Santé et des Services sociaux [MSSS] (2003a). *Programme national de santé publique 2003-2012*. Québec, QC: Direction des communications, Ministère de la Santé et des Services sociaux.

Ministère de la Santé et des Services sociaux [MSSS] (2003b). *Quebec Public Health Program 2003-2012*. Québec, QC: Direction des communications, Ministère de la Santé et des Services sociaux.

Murphy J, & Isaacs B. (1982). The post-fall syndrome: A study of 36 elderly patients. *Gerontology, 28*, 265-270.

Murphy, S.L., Williams, C.S., & Gill, T.M. (2002). Characteristics associated with fear of falling and activity restriction in community-living older persons. *Journal of the American Geriatrics Society, 50*, 516-520.

Murphy, S.L., Dubin, J.A., & Gill, T.M. (2003). The development of fear of falling among community-dwelling older women: Predisposing factors and subsequent fall events. *Journal of Gerontology: Medical Sciences, 58A*(10), 943-947.

Myers, A.H., Young, Y., & Langlois, J.A. (1996). Prevention of falls in the elderly. *Bone, 18S,* 87-101.

Myers, A.M., Powell, L.E., Maki, B.E., Holliday, P.J., Brawley, L.R., & Sherk, W. (1996). Psychological indicators of balance confidence: Relationship to actual and perceived abilities. *Journal of Gerontology: Medical Sciences, 51A*(1), 37-43.

Myers, A.M., Fletcher, P.C., Myers, A.H., & Sherk, W. (1998). Discriminative and evaluative properties of the Activities-specific Balance Confidence (ABC) Scale. *Journal of Gerontology: Medical Sciences, 53A*, 287-94.

Myers, A.M. (1999). *Program evaluation for exercise leaders.* Waterloo, ON: Human Kinetics.

Nitz, J.C., & Low Choy, N. (2004). The efficacy of a specific balance-strategy training programme for preventing falls among older people: a pilot randomised controlled trial. *Age and Ageing, 33*, 52-58.

Oakley, A., Dawson, M.F., Fullerton, D., Holland, J., Arnold, S., Cryer, C., Doyle, Y., Rice, J., & Hodgson, CR. (1996). Preventing falls and subsequent injury in older people. *Effective Health Care Bulletins, 2*(4), 1-16.

O'Loughlin, J.L., Robitaille, Y., Boivin, J.-F., & Suissa, S. (1993). Incidence of and risk factors for falls ad injurious falls among the community-dwelling elderly. *American Journal of Epidemiology, 137*(3), 342-354.

Parry, S.W., Steen, N., Galloway, S.R., Kenny, R.A., & Bond, J. (2001). Falls and confidence related quality of life outcome measures in an older British cohort. *Postgraduate Medical Journal, 77*, 103-108.

Pfeiffer, E. (1975). A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of the American Geriatrics Society, 23*, 433-441.

Powell, L.E., & Myers, A.M. (1995). The Activities-specific Balance Confidence (ABC) Scale. *Journal of Gerontology: Medical Sciences, 50A*, 28-34.

Prohaska, T., Belansky, E., Belza, B., Buchner, D., Marshall, V., McTigue, K., Satariano, W., & Wilcox, S. (2006). Physical activity, public health, and aging: Critical issues and research priorities. *Journal of Gerontology: Social Sciences, 61B*(5), 267-273.

Province, M.A., Hadley, E.C., Hornbrook, M.C., Lipsitz, L.A., Miller, J.P., Mulrow, C.D., Ory, M.G., Sattin, R.W., Tinetti, M.E., & Wolf, S.L. (1995). The effects of exercise on falls in elderly patients. A preplanned meta-analysis of the FICSIT Trials. Frailty and Injuries: Cooperative Studies of Intervention Techniques. The *Journal of the American Medical Association, 273*(17), 1341-1347.

Public Health Agency of Canada (2005). *Inventory of falls prevention initiatives in Canada*. Ottawa, ON: Division of Aging and Seniors, Public Health Agency of Canada.

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical linear models. Applications and data analysis methods.* 2nd ed. Thousand Oaks: Sage Publications.

Rawsky, E. (1998). Review of the literature on falls among the elderly. Image: *Journal of nursing scholarship*, *30*(1), 7-52.

Reinsch, S., MacRae, P., Lachenbruch, P.A., & Tobis, J.S. (1992). Attempts to prevent falls and injury: A prospective community study. *The Gerontologist, 32*(4), 450-456.

Réseau francophone de prévention des traumatismes et de promotion de la sécurité (2005). *Référentiel de bonnes pratiques. Prévention des chutes chez les personnes âgées à domicile*. Saint-Denis: Éditions INPES.

Richard, L., Gauvin, L., Gosselin, C., Ducharme, F., Sapinski, J.P., & Trudel, M. (sous presse). Integrating the ecological approach in health promotion for older adults: a survey of programmes aimed at elder abuse prevention, falls prevention, and appropriate medication use. *International Journal of Public Health.*

Robertson, M.C., Devlin, N., Gardner, M.M., & Campbell, A.J. (2001). Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. *British Medical Journal, 322*, 697-701.

Robitaille, Y., Laforest, S., Fournier, M., Gauvin, L., Parisien, M., Corriveau, H., Trickey, F. & Damestoy, N. (2005). Moving forward in fall prevention: An intervention to improve balance among older adults in real-world settings. *American Journal of Public Health, 95*(11), 2049-2056.

Robitaille, Y., & Gagné, M. (2007). Les hospitalisations pour chute chez les adultes âgés : un aperçu québécois. *Bulletin épidémiologique hebdomadaire sur les traumatismes et accidents de la vie courante, octobre 2007*, 325-328.

Robitaille, Y., Gauvin, L., Laforest, S., Fournier, M., Corriveau, H., & Filiatrault, J. (en préparation). Exploring the impact of a community-based falls prevention program offered in natural settings on falls incidence. À soumettre à la revue *American Journal of Public Health.*

Rosenstock, I.M. (1990). The Health Belief Model: Explaining health behaviour through expectancies, in K. Glanz, F.M. Lewis, & B.K. Rimer (Eds). *Health behaviour and health education* (2nd ed.) (pp. 39-62). San Francisco: Jossey-Bass Publishers.

Rubenstein, L.Z., Josephson, K.P., & Osterweil, D. (1996). Falls and fall prevention in the nursing home. *Clinics in Geriatric Medicine, 12*(4), 881-902.

Rubenstein, L. Z., & Josephson, K. R., (2002). The epidemiology of falls and syncope. *Clinics in Geriatric Medicine, 18*, 141-158.

Rubenstein, L.Z. (2006). Falls in older people: Epidemiology, risk factors and strategies for prevention. *Age and Ageing, 35*(S2), ii37-ii41.

Salbach, N.M., Mayo, N.E., Hanley, J.A., Richards, C.L., & Wood-Dauphinee, S. (2006). Psychometric evaluation of the original and Canadian French version of the Activities-specific Balance Confidence Scale among people with stroke. *Archives of Physical Medicine and Rehabilitation, 87*, 1597-1604.

Sanson-Fisher, R.W., Bonevski, B., Green, L.W., & D'Este, C. (2007). Limitations of the randomized controlled trial in evaluating population-based health interventions. *American Journal of Preventive Medicine, 33*, 155-161.

Sattin, R.W., Easley, K.A., Wolf, S.L., Chen, Y., & Kutner, M.H. (2005). Reduction in fear of falling through intense Tai Chi exercise training in older, transitionally frail adults. *Journal of the American Geriatrics Society, 53*, 1168-1178.

Scott, V.J., Dukeshire, S., Gallagher, E.M., & Scanlan, A. (2001a). *Répertoire des programmes canadiens de prévention des chutes chez les aînés vivant dans la communauté*. Ottawa, ON: Santé Canada, Division du vieillissement et des aînés.

Scott, V.J., Dukeshire, S., Gallagher, E.M., & Scanlan, A. (2001b). *Guide des meilleures pratiques pour la prévention des chutes*. Ottawa, ON : Santé Canada, Division du vieillissement et des aînés.

Sherwood, N.E., & Jeffery, R.W. (2000). The behavioural determinants of exercise: Implications for physical activity interventions. *Annual Review of Nutrition, 20*, 21-44.

Sihvonen, S.E., Sipilä, S., & Era, P.A. (2004). Changes in postural balance in frail elderly women during a 4-week visual feedback training: A randomized controlled trial. *Gerontology, 50*, 87-95.

Simpson, J.M., Marsh, N., & Harrington, R. (1998). Guidelines for managing falls among elderly people. *British Journal of Occupational Therapy, 61*(4), 165-168.

Simpson, J.M., & Jones, F. (2004). Physiological or psychological change? Which is the most important rehabilitation outcome for older people who fall? *Age and Ageing, 33*, 204-211.

Stalenhoef, P.A., Crebolder, H.F.J.M., Knottnerus, J.A., & van der Horst, F.G.E.M. (1997). Incidence, risk factors and consequences of falls among elderly subjects living in the community. A criteria-based analysis. *The European Journal of Public Health, 7*(3), 328-334.

Statistics Canada (2000). *Canadian Community Health Survey*. Ottawa, ON: Statistics Canada.

Tennstedt, S., Howland, J., Lachman, M., Peterson, E., Kasten, L., & Jette, A. (1998). A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *Journal of Gerontology: Psychological Sciences, 53B*, 384-392.

Tideiksaar, R. (1996). Preventing falls: How to identify risk factors, reduce complications. *Geriatrics, 51*(2), 43-53.

Tinetti, M.E., Richman, D., & Powell, L. (1990). Falls Efficacy as a measure of fear of falling. *Journals of Gerontology: Psychological Sciences, 45B*, 239-243.

Tinetti, M.E., Mendes de Leon, C.F., Doucette, J.T., & Baker, D.I. (1994a). Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *Journal of Gerontology: Medical Sciences, 49A*(3), 140-147.

Tinetti, M.E., Baker, D.I., McAvay, G., Claus, E.B., Garrett, P., Gottschalk, M., Koch, M.L., Trainor, K., & Horwitz, R.I. (1994b). A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *New England Journal of Medicine, 331*, 821-827.

Topp, R., Mikesky, A., & Bawel, K. (1994). Developing a strength training program for older adults: Planning, programming, and potential outcomes. *Rehabilitation Nursing, 19*(5), 266-272.

Trickey, F., Parisien, M., Robitaille, Y., Gosselin, C., & Laforest, S. (1999a). *Programme intégré d'équilibre dynamique – PIED. Guide d'animation.* Montréal, QC: Direction de la santé publique de Montréal, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Robitaille, Y., Laforest, S., Gosselin, C., & Parisien, M. (1999b). *Évaluation du Programme intégré d'équilibre dynamique (P.I.E.D.) pour la prévention des chutes chez les aînés. Rapport détaillé*. Montréal, QC: Direction de santé publique de Montréal-Centre, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Robitaille, Y., Damestoy, N., Genest, C., Laforest, S., & Parisien, M. (2001). *Adoption naturelle du programme PIED de 1997 à 2001. Bilan et perspectives*. Montréal, QC: Direction de la santé publique de Montréal-Centre, Régie régionale de la Santé et des Services sociaux.

Trickey, F., Parisien, M., Laforest, S., Genest, C., & Robitaille, Y. (2002). *Programme intégré d'équilibre dynamique – PIED. Guide d'animation.* Montréal, QC: Direction de santé publique de Montréal.

Trickey, F., Parisien, M., Laforest, S., Genest, C., & Robitaille, Y. (2003). *Stand Up! A fall prevention programme for seniors. Programme Guide*. Montréal, QC: Direction de santé publique de Montréal.

van Haastregt, J.C.M., Diederiks, J.P.M., van Rossum, E., de Witte, L., Voorhoeve, P.M., & Crebolder, H.F.J.M. (2000). Effects of a programme of multifactorial home visits on falls and mobility impairments in elderly people at risk: Randomised controlled trial. *British Medical Journal, 321*, 994-998.

van Heuvelen, M.J., Horchstenbach, J., de Greef, J., Brouwer, W.H., Mulder, T., & Scherder, E. (2005). Is the Activities-specific Balance Confidence Scale suitable for Dutch older persons living in the community ? [Article in *Dutch]* *Tijdschrift voor Gerontologie en Geriatrie, 36*(4), 146-154.

Victora, C.G., Habicht, J.-P., & Bryce, J. (2004). Evidence-based public health: Moving beyond randomized trials. *American Journal of Public Health, 94*(3), 400-405.

Victorian Government Department of Human Services (2001). *Evidence-based health promotion resources for planning. No. 3 Falls prevention.* Melbourne, Victoria: Public Health Division, Victorian Government Department of Human Services.

Wallsten, S.M., Bintrim, K., Denman, D.W., Parrish, J.M., & Hughes, G. (2006). The effect of Tai Chi Chuan on confidence and lower extremity strength and balance in residents living independently at a continuing care retirement community. *The Journal of Applied Gerontology, 25*(1), 82-95.

Ware, J.E., Snow, K.K., & Kosinski, M. (2000). *SF-36 Health Survey: Manual and Interpretation Guide*. Lincoln, RI: Quality Metric Incorporated.

Weatherall, M. (2004). Prevention of falls and fall-related fractures in community-dwelling older adults: A meta-analysis of estimates of effectiveness based on recent guidelines. *Internal Medicine Journal, 34*, 102-108.

Weerdesteyn, V., Rijken, H., Geurts, A.C., Smits-Engelsman, B.C., Mulder, T., & Duysens, J. (2006). A five-week exercise program can reduce falls and improve obstacle avoidance in the elderly. *Gerontology, 52*(3), 131-141.

Whitney, S.L., Hudak, M.T., & Marchetti, G.F. (1999). The Activities-specific Balance Confidence Scale and the Dizziness Handicap Inventory: A comparison. *Journal of Vestibular Research, 9*, 253-259.

Wilson, M.-M.G., Miller, D.K., Andresen, E.M., Malmstrom, T.K., Miller, J.P., & Wolinsky, F.D. (2005). Fear of falling and related activity restriction among middle-aged African Americans. *Journal of Gerontology: Medical Sciences, 60A*, 355-360.

Wolf, S.L., Barnhart, H.X., Kutner, N.G., McNeely, E., Coogler, C., Xu, T., The Atlanta FICSIT Group. (1996). Reducing frailty and falls in older persons: An investigation of Tai Chi and computerize balance training. *Journal of the American Geriatrics Society, 44*, 489-497.

Wolf, S.L., Sattin, R.W., O'Grady, M., Freret, N., Ricci, L., Greenspan, A.I., Xu, T., & Kutner, M. (2001). A study design to investigate the effect of intense Tai Chi in reducing falls among older adults transitioning to frailty. *Controlled Clinical Trials, 22*(6), 689-704.

Yardley, L., & Smith, H. (2002). A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-dwelling older people. *The Gerontologist, 42*, 17-23.

Yardley, L. (2004). Fear of falling: links between imbalance and anxiety. *Reviews in Clinical Gerontology, 13*, 195-201.

Yardley, L., Beyer, N., Hauer, K., Kempen, G., Piot-Ziegler, C. and Todd, C. (2005). Development and initial validation of the Falls Efficacy Scale-International (FES-I). *Age and Ageing, 34*, 614-619.

Yates, S.M., & Dunnagan, T.A. (2001). Evaluating the effectiveness of a home-based fall risk reduction program for rural community-dwelling older adults. *Journal of Gerontology: Medical Sciences, 56A*(4), 226-230.

Zhang, J.-G., Ischikawa-Takata, K., Yamazaki, H., Morita, T., & Ohta, T. (2005). The effects of Tai Chi Chuan on psychological function and fear of falling in the less robust elderly: An intervention study for preventing falls. *Archives of Gerontology and Geriatrics, 42*, 107-116.

Zijlstra, G.A.R., van Haastregt, J.C.M., van Eijk, J.Th.M., van Rossum, E., Stalenhoef, P.A., & Kempen, G.I.J.M. (2007a). Prevalance and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. *Age and Ageing, 36*, 304-309.

Zijlstra, GAR, van Haastregt, JCM, van Rossum, E, van Eijk, J.Th.M., Yardley, L., & Kempen, G. I. J. M. (2007b). Interventions to reduce fear of falling in community-living older people: A systematic review. *Journal of the American Geriatrics Society, 55*, 603-615.

ANNEXES

ANNEXE 1

Étude relative aux effets du programme PIED sur l'équilibre des participants (article publié en 2005 dans la revue *American Journal of Public Health*)
(Reproduit avec la permission
de l'*American Public Health Association*)

Moving Forward in Fall Prevention: An Intervention to Improve Balance Among Older Adults in Real-World Settings

Yvonne Robitaille, PhD, Sophie Laforest, PhD, Michel Fournier, MA, Lise Gauvin, PhD, Manon Parisien, MSc, Hélène Corriveau, PhD, Francine Trickey, MSc, and Nicole Dumestoy, MD, MSc, FRCPC

Objectives. We investigated the effectiveness of a group-based exercise intervention to improve balancing ability among older adults delivered in natural settings by staff in local community organizations.

Methods. The main component of the intervention consisted of biweekly group-based exercise sessions conducted over 12 weeks by a professional, coupled with home-based exercises. In a quasiexperimental design, 10 community organizations working with older adults offered the intervention to groups of 5 to 15 persons concerned about falls, while 7 organizations recruited similar groups to participate in the control arm of the study. Participants (98 experimental and 102 control) underwent balance assessments by a physiotherapist at registration and 3 months later.

Results. Eighty-nine percent of participants attended the 3-month measurement session (n = 177). A linear regression analysis showed that after adjusting for baseline levels of balance and demographic and health characteristics, the intervention significantly improved static balance and mobility.

Conclusion. Structured, group-based exercise programs offered by community organizations in natural settings can successfully increase balancing ability among community-dwelling older adults concerned about falls. (*Am J Public Health.* 2005;95:2049–2056. doi:10.2105/AJPH.2004.057612)

Falls contribute significantly to morbidity among older adults (aged 65 years and older),[1,2] and balance problems are an important risk factor for falls.[3] Despite evidence showing that specific exercise programs can improve balancing ability, little is known about the success of these programs when broadly delivered in a community context.

Since the mid-1990s, randomized controlled trials have demonstrated that it is possible to reduce the incidence of falls among older adults with physical exercise interventions to improve balance.[4–6] Although initial studies focused mainly on intensive individual programs, more recent studies have examined group programs.[7,8] These studies were conducted in contexts where research method constraints prevailed over those related to result implementation (generalization). Unfortunately, interventions shown to be effective in tightly controlled efficacy studies do not necessarily yield similar effects when delivered on a large scale in clinical or community settings.[9] The pivotal issue is how to disseminate interventions, found to be effective, in real-life contexts without jeopardizing components essential to their efficacy.

Given the demonstrated efficacy of exercise interventions in improving balance and reducing falls and the dearth of information on their effectiveness in real-life settings, the purpose of this study was to determine the effectiveness of a group-based exercise intervention designed to improve balance among older adults. Our hypothesis was that even when delivered in a natural setting by personnel and staff in local older-adult centers and community health organizations, a group-based exercise intervention may improve balance among older adults concerned about falls.

The Intervention

Stand Up! is a multifaceted fall-prevention program developed for older independent adults who have a history of falls or are worried about their balance, but who can safely exercise in a group. Intervention objectives are to improve balance and leg strength, to initiate adoption and maintenance of regular physical activity, and to promote home safety and safe behaviors. The main component of this intervention consists of biweekly group-based exercise sessions spanning a 12-week period coupled with home-based exercises. The exercise program is designed to enhance various systems involved in balance, such as proprioception, leg strength, and ankle mobility.[10] The program includes movements derived from tai chi and leg-strengthening exercises with elastic bands of varying thickness. Participants are also invited to exercise on their own at home, at least once a week, with the help of a poster depicting 12 exercises. Another component of the program not analyzed by our study consists of weekly 30-minute group discussions on safe behaviors and home modifications. Intervention activities were conducted by a fitness or rehabilitation professional who had access to a detailed intervention guide[11] and had followed a 1-day training session.

The 12-week session costs about Can$1900 (US$1400). This amount averages out to Can$125 (US$95) per participant, if a group is composed of 15 older adults. In several regions of the province of Quebec, health authorities provide some financial support.

An earlier version of Stand Up! included an extra weekly tai chi group session, which meant the group met 3 times a week, but did not include home exercises. In a small quasi-experimental study, this earlier version of the program was found to be effective in increasing balance.[12] However, a survey of community organizations revealed that the tai chi component was often omitted from program implementation because it required the involvement of a tai chi expert. Therefore, the program was redesigned in 2002 to take into consideration constraints of community organizations while maintaining elements essential to the efficacy of the program. We assessed the revised version of this program.

METHODS

To minimize interference with regular activities of the community organizations, a quasiexperimental design was used, thus providing an appropriate test of the effectiveness of the intervention when delivered in a real-world setting.

Participants and Recruitment

In winter 2002, 10 community organizations that provided services to older adults in the Montreal area (Quebec, Canada) were invited to offer the program (hereafter termed "experimental organizations"), and 7 similar organizations were asked to recruit participants for the control arm of the study (hereafter "control organizations"). The latter agreed to wait until the study was completed before offering the program in their localities. A total of 200 participants were recruited by all 17 organizations, in clusters of 5 to 17 people. Recruitment of experimental and control group participants was matched for seasonality. Older adults recruited by experimental organizations received the Stand Up! Program, whereas those recruited in control organizations did not.

Experimental and control organizations were invited to target the population for which Stand Up! was developed, namely older adults who had already had a fall or were worried about their balance or about falling. A capacity-to-exercise grid included in the Stand Up! Program Guide[11] provides a series of questions that determine whether the potential participant can perform relatively demanding exercises within a group, should have prior medical authorization, or should be referred to a program involving lower doses of exercise. A minimum age of 60 years was required to participate in this study. Figure 1 illustrates the study design, as well as participant flow through the study. The unit of intervention assignment was the group. The sample was representative of organizations interested in offering the program and of individuals who would register for it. The number of groups included was determined by the budget available for the study. We believe that the sample is adequate to test whether or not an intervention is effective in a real-world setting. With a sample size of 200 subjects, the study has an 80% power to detect a 15% difference in balance improvement.

Physical Performance Measures

The main outcome of this evaluation was balance. We measured the following 3 dimensions of balance: (1) static balance (one-legged stance test with eyes open and closed,[13,14] and tandem stance test);[14,15] (2) stability limits (functional reach[13,16] and lateral reach tests);[17,18] and (3) mobility (tandem walk test).[19] Another motor function tested was the strength of lower extremity muscles (sit-to-stand).[20,21] Furthermore, we used 2 measurements of vitality to describe the targeted population: 4-meter maximal walking speed[14,22] and grip strength with the Jamar dynamometer (Sammons Preston, Bolingbrook, Ill).[23,24] These tests were chosen because they have been shown to be valid and reliable, sensitive to change, and easy and safe to administer in a community setting. Test-retest reliability for all of these physical performance measures was established in previous studies with similar groups.[13,14,17,25]

Each participant was assessed by the same trained physiotherapist who was blinded to group membership. Time trials were limited to a maximum of 60 seconds. Two trials were carried out for each test, and the better score was used in analyses. Participant assessments were conducted at a location in the neighborhood of each group to maintain a high study participation rate.

Demographic, Health, and Other Data

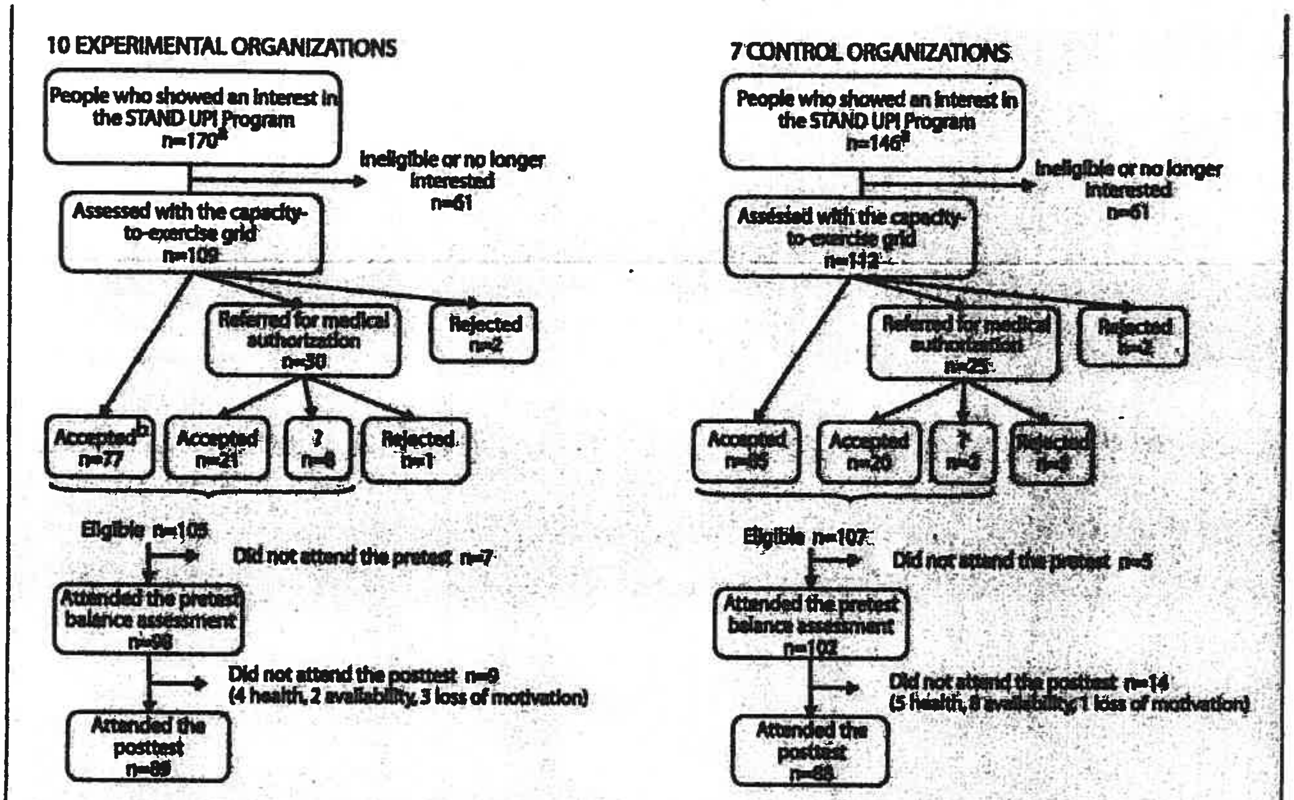
Participants' demographic and health data were collected in face-to-face interviews with a questionnaire covering such factors as physical health, including self-perceived health status,[26] medical consultations,[27] health problems, and medications; mental health and vitality[28]; number of falls in the year preceding baseline assessment[27]; balance self-confidence[29]; and frequency and variety of physical activities in the previous month.[30]

A representative from each organization was asked how participants were recruited and assessed so that the research team could describe the recruitment process. In addition, experimental organizations provided data about the program set-up (e.g., training of the session leader, cost for participation in the program, and number of sessions offered). The session leader monitored and recorded the participants' attendance at each exercise session.

Statistical Analysis

To assess the effectiveness of the intervention, data were analyzed on an intention-to-treat basis. At the beginning of the study, we compared the demographics, health, balance, and strength of the 2 groups. We then calculated raw changes in levels of balance by subtracting measurements taken at baseline from those taken at the end of the program 3 months later.

We performed linear regression analyses for each outcome variable using forward inclusion according to the following steps: (1) assessment of the effect of group membership with control for baseline scores; (2) control for a series of covariates chosen from the literature, including demographic variables (age, gender, and level of education), physical health (perceived health status, number of medical consultations during the previous 3 months, number of health problems, and classes of medications with side effects known to impede balance), mental health, history of falls and balance self-confidence, and frequency and diversity of physical activity; and (3) test of modifier effects of covariates on intervention effects by adding interaction terms. Statistical assumptions underlying linear regression were not violated except for 1 outcome variable, namely, the one-legged stance with eyes open variable, which showed a ceiling effect. Alternative analyses (nonparametric regression and time-to-event analysis) produced similar results. For the sake of brevity, only the results of the linear regression are presented here. Similarly, given that the unit of assignment was the group, and the final data set had a nested structure (repeated measures nested within persons nested within groups that were designated either experimental or control), we also replicated the linear regression analyses with multilevel modeling techniques. Results were identical to those found with linear regression analyses. Because the focus of our study was on whether



aMinimum number. Some organizations did not document the number of interested individuals.
bOne participant was subsequently deemed ineligible.
? = The medical authorization forms were lost or never completed.

FIGURE 1—Study design and flow of participants through the study.

people can improve their balance rather than on differential effects across groups, we elected to present results of linear regression analyses. Data were analyzed with SPSS (Chicago, Ill) software, version 11.0.[31]

RESULTS

Recruitment

As shown in Figure 1, most interested individuals (73.3%) were immediately accepted as participants in the study, once the capacity-to-exercise questionnaire had been administered. However, medical authorization was requested in nearly one fourth of the candidates. In 7% of cases, a physician determined that the person should not participate in the intervention.

A total of 212 older adults were eligible for the study, but 12 did not attend the baseline evaluation. Of the 200 registrants at baseline (98 at intervention sites and 102 at control sites), 88.5% attended the 3-month measurement session (n = 177). The 23 subjects lost to follow-up did not differ statistically from maintainers with respect to demographics and health data at baseline, except that a larger proportion of the former lived alone and had poorer balance than did of subjects who attended the posttest session (one-legged stance [right leg]—eyes open and closed, Wilcoxon test, $P < .05$).

Characteristics at Baseline

At baseline, the mean age of participants was 73.9 years, and 84% were women. More than half of study participants lived alone, and almost 40% reported having fallen in the year before baseline assessment. Comparison of intervention and control participants at baseline did not reveal statistically significant differences in demographics, health, physical activity, or vitality indicators. Intervention and control participants also had similar balance levels at baseline, except for their scores on lateral reach (both sides). Table 1 shows that the subjects varied widely in age, education, and health status. The individuals who signed up for the intervention were proportionately older than the elderly population living in the region of Montreal. Only 12.5% of subjects were aged 60 to 64 years, whereas this age group represented 23% of people aged 60 years and over in Montreal. However, the proportion of participants aged 65 years and over corresponded with their proportion among the elders in Montreal. The intervention also drew proportionately more women (84%), representing a higher share than in the elderly population (60%).

TABLE 1—Baseline Demographic, Health, and Physical Performance Characteristics of Intervention and Control Groups

	Experimental (n = 98)	Control (n = 102)	All (n = 200)
Demographics			
Age, y			
Mean (SD)	[illegible]	74.2 (7.0)	[illegible]
Range	[illegible]	[illegible]	
Female, %	83.7	84.3	84.0
Live alone, %	65.3	69.6	67.5
Education, %			
Primary level	28.6	20.6	24.5
High school level	42.9	46.1	44.5
College/university level	28.6	33.3	[illegible]
Health			
Self-perceived, %			
Poor/medium	25.8	13.8	[illegible]
Good/very good	56.7	73.5	[illegible]
Excellent	17.5	12.7	[illegible]
Mental health, mean score (SD)	77.7 (15.2)	76.7 (16.3)	77.2 (15.8)
Medical consultations, last 3 months, mean (SD)	1.5 (1.3)	1.5 (1.6)	1.4 (1.3)
Number of health problems, mean (SD)	2.0 (1.8)	2.0 (1.3)	2.0 (1.5)
Number of medication classes, mean (SD)	3.4 (1.9)	3.4 (1.8)	3.4 (1.9)
Falls in last year, %			
0 falls	61.2	61.8	61.5
1 fall	22.4	24.5	23.5
2 falls or more	16.3	13.7	15.0
Balance-related self confidence,[a] mean (SD) (score range: 12.5–100)	81.8 (15.1)	79.4 (17.3)	80.6 (16.3)
Physical activity, mean (SD)			
Diversity score	[illegible]	4.15 (2.2)	4.15 (2.1)
Frequency score	18.4 (8.8)	15.5 (7.6)	[illegible]
Vitality indicators, mean (SD)			
Walking speed, s	2.85 (1.4)	2.85 (1.0)	2.85 (1.2)
Grip strength, kg, R[b]	24.6 (8.1)	22.7 (7.0)	[illegible]
Outcomes (physical performance), mean (SD)			
Static balance, s			
One-legged stance—eyes open, L	11.2 (15.8)	12.2 (15.3)	11.7 (15.5)
One-legged stance—eyes open, R	14.3 (19.7)	11.8 (14.7)	[illegible]
One-legged stance—eyes closed, L	2.8 (3.0)	2.5 (2.2)	[illegible]
One-legged stance—eyes closed, R	2.7 (3.3)	2.5 (2.0)	[illegible]
Tandem stance	28.1 (24.2)	27.8 (24.3)	[illegible]
Limits of stability, cm			
Functional reach	24.3 (6.3)	24.7 (6.7)	[illegible]
Lateral reach, L[b]	14.7 (5.0)	12.8 (4.3)	[illegible]
Lateral reach, R[b]	14.9 (5.3)	13.5 (4.0)	[illegible]
Mobility, s			
Tandem walk	18.2 (18.8)	18.0 (8.8)	[illegible]
Strength, s			
Sit-to-stand	12.8 (6.3)	12.7 (4.5)	12.7 (5.4)

Note. L = left; R = right.
[a]In a separate paper, we will report the results of a current study on the psychometric properties of a modified version of the Activities-Specific Balance Confidence (ABC) Scale.
[b]Means of experimental and control groups statistically different (t test; $P < .05$).

Outcome Measurement

Intervention participants improved more than control participants on all static balance indicators except one (lateral reach both sides; Table 2). For example, intervention participants improved their balance by 5.3 seconds from baseline in the one-legged stance with eyes open (left; from 12.1 to 17.4), whereas the performance of control participants declined by 2.4 seconds (from 13.1 to 10.7). Intervention participants also showed greater improvement in mobility and strength indicators. Taking into account intragroup variability at baseline, effect sizes were small to medium in magnitude in favor of intervention participants except on the limits of stability indicators where mixed results were observed.

In Table 3, unstandardized regression coefficients indicate the number of seconds or centimeters of change associated to being part of the experimental group. Assessment of the effect of group membership, with control only for balance at baseline (reduced model), revealed intervention group improvements in 4 indicators of static balance and mobility. After adjusting for demographic, health, and physical activity characteristics (complete model), the intervention effects on 5 of the balance assessments were statistically significant: one-legged stance eyes open (both sides), one-legged stance eyes closed (left), tandem stance, and tandem walk. As for strength, change among participants in the intervention was positive, but results were not statistically significant. Results of the linear regression analysis with the complete model suggest that the program—and not differences in composition of experimental and control groups—was responsible for improving balance in the experimental group. The proportion of variance explained by group membership (partial η^2) was highest for static balance and mobility indicators.

Finally, interaction terms testing the modifying effects of age, history of falls, perceived health status, and baseline level of balance showed no consistent pattern. However, the following interaction effects were statistically significant: (1) for static balance, baseline values in the one-legged stance left with eyes closed modified intervention effects, with improvement being most pronounced among individuals with the highest baseline initial

TABLE 2—Balance and Strength Evolution 3 Months After Baseline

	Experimental (n = [illegible])		Control (n = [illegible])		Experimental	Control
	Baseline T1 Mean (SD)	3 months T2 Mean (SD)	Baseline T1 Mean (SD)	3 months T2 Mean (SD)	Effect Size (3 Months–Baseline)/SD[b]	Effect Size (3 Months–Baseline)/SD[b]
Static balance, s						
One-legged stance—eyes open, L	12.1 (16.3)	17.4 (19.7)	13.1 (16.0)	10.7 (14.7)	0.33	−0.14
One-legged stance—eyes open, R	16.3 (19.2)	20.0 (21.0)	12.8 (15.8)	13.4 (16.3)	0.24	0.04
One-legged stance—eyes closed, L	2.8 (3.5)	3.5 (3.9)	2.6 (2.3)	2.4 (1.8)	0.20	−0.09
One-legged stance—eyes closed, R	2.8 (1.9)	3.6 (3.9)	2.6 (2.3)	2.6 (2.0)	0.42	0.00
Tandem stance	28.0 (23.8)	33.8 (24.8)	28.5 (24.7)	31.2 (24.3)	0.24	0.11
Limits of stability, cm						
Functional reach	24.9 (5.7)	25.5 (6.6)	24.8 (6.5)	24.7 (6.4)	0.09	−0.02
Lateral reach, L	14.8 (4.9)	15.3 (5.0)	12.7 (4.2)	14.0 (4.5)	0.10	0.31
Lateral reach, R	15.8 (5.5)	15.8 (5.0)	13.4 (4.0)	14.3 (4.6)	0.00	0.23
Mobility, s						
Tandem walk[a]	18.8 (11.0)	12.0 (6.5)	18.2 (10.1)	15.8 (8.0)	−0.46	−0.25
Strength, s						
Sit-to-stand[a]	12.8 (6.5)	11.4 (4.1)	12.3 (3.5)	11.7 (3.5)	−0.19	−0.18

Notes: L = left; R = right.
[a]The best scores are the lowest.
[b]SD of baseline scores.

TABLE 3—Balance and Strength Evolution After Control for Covariates

	Reduced Model[a]			Complete Model[b]					
Outcome Variables	Unstandardized Coefficient β[c]	P	R^2	Unstandardized Coefficient β[c]	95% CI	Standardized Coefficient β[c]	P	R^2	Partial η^2 [d]
Static balance, s									
One-legged stance—eyes open, L	7.44	<.01	0.61	7.48	(3.78, 11.18)	0.21	<.01	0.62	10.9%
One-legged stance—eyes open, R	4.43	.02	0.58	5.12	(1.21, 9.03)	0.14	.01	0.61	3.8%
One-legged stance—eyes closed, L	1.08	<.01	0.48	0.97	(0.35, 1.59)	0.18	.02	0.52	5.4%
One-legged stance—eyes closed, R	0.54	.18	0.41	0.54	(−0.21, 1.40)	0.09	.14	0.44	1.3%
Tandem stance	4.00	.12	0.54	5.15	(0.22, 10.08)	0.11	.04	0.63	2.3%
Limits of stability, cm									
Functional reach	0.79	.32	0.41	0.48	(−1.07, 2.02)	0.04	.55	0.51	0.3%
Lateral reach, L	0.16	.81	0.29	0.20	(−1.16, 1.56)	0.02	.77	0.38	0.2%
Lateral reach, R	0.39	.56	0.21	0.56	(−0.86, 1.98)	0.08	.44	0.30	0.6%
Mobility, s									
Tandem walk	−3.50	.01	0.13	−3.80	(−6.48, −1.12)	−0.21	.01	0.28	4.9%
Strength, s									
Sit-to-stand	−0.46	.26	0.54	−0.54	(−1.34, 0.26)	−0.07	.19	0.60	0.8%

Notes: L = left; R = right.
[a]Reduced model included baseline measure and group membership.
[b]The variables included in the complete model of the linear regression analysis are as follows: measures of balance at baseline, a series of demographic variables (age, gender, and level of education), a series of physical health variables (perceived health status, number of medical consultations during the last 3 months, number of health problems, and number of medication classes), mental health, fall history and balance self-confidence, and practice of physical activity (frequency and diversity).
[c]β = regression coefficient of the group membership variable (evolution attributable to membership in the experimental group).
[d]Partial η^2 = proportion of the variance explained by group membership (experimental/control).

scores (P=.001); (2) for limits of stability, history of falling modified intervention effects on lateral reach (left; P=.03), with people who had experienced the most falls improving the least; (3) for mobility, age modified the intervention effect (P=.03), with improvements being superior among older people, and perception of health also modified intervention effects (P=.04), with higher improvements among persons judging their health to be neither poor nor excellent; and (4) for strength, baseline values in the sit-to-stand modified intervention effects, with more pronounced improvements among individuals with weakest scores at baseline (P<.001).

Compliance and Attendance Rates

The attendance rate for group exercise sessions was 78%. Seventy percent of intervention participants attended more than three fourths of the sessions (16 of 22 sessions). Five people dropped out during the first 2 weeks of the program. Regarding self-reported home exercise compliance, 78% of participants in the experimental group indicated they exercised at home at least once a week, as recommended by the Stand Up! program.

DISCUSSION

Summary of Results

The purpose of this study was to determine the effectiveness of a group-based exercise intervention designed to improve balance among older adults when delivered in a real-world setting by local community organizations. Results showed that a structured, group-based exercise program offered by personnel and staff at older-adult community centers and health clinics successfully increased static balance and mobility among older adults concerned about falls.

These findings are consistent with those of previous researchers[7,8,32] who reported that group-based (therefore, not individually prescribed) exercises targeting balance can actually improve balance among older adults. However, to our knowledge, this is the first study to demonstrate that intervention effects on balance are possible when the intervention is managed by community organizations and when participants register because they are concerned about their balance or worried about falls. In previous studies, interventions were carried out in research contexts, and participants were randomly assigned either to intervention or placebo groups. Participants either came from a sample drawn from electoral lists[7] or were referred by their physicians or other health professionals.[8] In our study, community organizations were responsible for recruiting participants and delivering the intervention. We believe this is an important step in moving efficacious interventions into community health promotion programs (for fall prevention) and making them widely accessible.

Strengths of the Study

Our effectiveness study measured the impact of an intervention tested under normal conditions in the field[33] with a rigorous methodology and valid indicators for several dimensions of the outcome. The 10 intervention organizations represented a broad range of environments, and the study obtained a high follow-up rate of 88.5%. Finally, an effort was made to document participation in the study and participants' attendance in the intervention without disturbing the natural dynamics of the setting.

Limitations

The question arises whether the 10 organizations that offered the program are different and perhaps more dynamic than the control organizations (early adopter effect). Given that all of the organizations—even the control organizations—showed a marked interest in offering the program, we believe that the early adopter effect was minimal.

As in any nonrandomized study design, one cannot completely exclude the possibility of a confounding variable not controlled by the analysis. However, given the similarity of the experimental and control organizations, similar manner in which the subjects were selected, pairing of experimental and control groups for season, rigorous measurement process for balance (e.g., rigorous protocol, supervised measuring, and blind testing) and analysis strategies chosen, it is likely that participation in the Stand Up! program is, indeed, responsible for improvements in the group that received the intervention. Furthermore, some authors believe that randomized controlled trials are not the ideal model when interventions are complex or designed for a variety of settings.[33,34]

Generalizability of the Results

With respect to the intervention, this program can be used elsewhere and is likely to have similar effects when offered to a similar target population. A complete intervention guide is available, making it easy to use in different settings. More broadly, we have shown that group-based exercises programs can effectively enhance balance. To do so, these programs must do the following: (1) focus on the various systems involved in balance; (2) respect known principles of the biomechanical model for efficacy, such as intensity of training, overloading, and progression[35]; (3) succeed in obtaining high attendance rates; and (4) be adapted to the realities of local community organizations.

With respect to participants (at the individual level), subjects registering in this study were quite heterogeneous in terms of demographics and health status at baseline. Subgroup analysis revealed few significant interaction effects, indicating that the program is probably equally effective across subgroups of older adults differing in age, history of falls, perceived health status and balance at baseline, and who chose to engage in this type of program. With aging, balance deficits are progressive; therefore, self-selection of people concerned with their balance and worried about falls seems appropriate. Given that individuals who did not attend the posttest were more frail than those who remained in the study, we must be cautious when generalizing program results to people who are the most frail. However, this latter group represents only 11.5% of people registered in the study. For maximum effect, the population needs to be neither too fit nor too frail.[8]

Program Effect on Falls

The program model postulates that, among older adults who are aware of mild difficulties with their balance, improving balance can reduce the overall number of falls and fall injuries. It was not possible to record falls appropriately (e.g., monthly phone calls or weekly postcards) in the context of this study. However, a recent randomized controlled trial[8] showed that with an improvement in balance of the magnitude observed in the present study, the fall rate of intervention participants was 40% lower than that of control participants. Given that the intervention in the study by Barnett et al.[8] comprised only exercises, it is likely that the reduction in falls observed by Barnett et al.[8] is related to the degree of balance improvement. It is reasonable to anticipate that improvements in balance observed in the present study would also translate into a reduction in falls. In addition, the most recent literature suggests that specific balance and strength exercise programs are effective in reducing the risk of falling. However, their optimal intensity and frequency remain to be determined.[1,36]

Several issues pertaining to fall prevention await additional research. For example, it would be useful if future trials examined how long the effects of exercise interventions last, under what conditions, and to what extent organizations continue offering the program. In this regard, analyses pertaining to the maintenance of intervention effects on balance 9 months after the end of the program are currently underway for future publication. Additional research is also required to discuss the pertinence of allotting public funds to such a program or having insurers pay for it.

Conclusions

The study design was that of a plausibility evaluation.[33,34] We examined the impact of an intervention on an intermediate variable (balance) and ruled out alternative explanations by including a control group and by controling for the main confounding variables. The intervention assessed—the Stand Up! program—reconciles the requirements to implement a program that is of appropriate intensity to actually improve balance while being flexible enough to be delivered in community settings. The intervention appears to be powerful enough to exert an impact on balance in a variety of clienteles in an array of settings.

These results should interest community organizations that already offer physical activity programs and that are actively involved in fall prevention. It should also be of value to clinicians who adopt the recommendations of Tinetti et al.[1] and would like to refer patients more than 75 years of age to such programs. Finally, these results could also benefit public health authorities seeking effective methods for reducing risk factors for falls in an aging population. ■

About the Authors

Yvonne Robitaille is with l'Institut national de santé publique du Québec and the Department of Epidemiology and Biostatistics, McGill University, Montreal. Sophie Laforest is with the Département de kinésiologie de l'Université de Montréal, Montreal, and with l'Institut de gérontologie sociale, CLSC René-Cassin, Montreal. Michel Fournier, Manon Parisien, and Francine Trickey are with the Direction de santé publique, Agence de développement des réseaux locaux de santé et de services sociaux de Montréal, Montreal. Lise Gauvin is with the Département de médecine sociale et préventive and the Centre de recherche Léa-Roback sur les inégalités sociales de santé de Montréal, Université de Montréal. Sophie Laforest and Lise Gauvin are also with the Groupe de recherche interdisciplinaire en santé, Université de Montréal. Hélène Corriveau is with the Centre de recherche sur le vieillissement and the Département de médecine de famille, Université de Sherbrooke, Quebec. Nicole Dumestoy is with the Direction de santé publique, Agence de développement des réseaux locaux de santé et de services sociaux de Laval, Quebec.

Requests for reprints should be sent to Yvonne Robitaille, Institut national de santé publique du Québec, 4835 rue Christophe-Colomb, Montréal, Québec, Canada H2J 3G8 (e-mail: yvonne.robitaille@inspq.qc.ca).

This research article was accepted March 3, 2005.

Contributors

Y. Robitaille, S. Laforest, L. Gauvin, M. Parisien, F. Trickey, and N. Dumestoy conceptualized the study. Y. Robitaille was principal investigator and supervised all aspects of its implementation. S. Laforest assisted in its implementation and led the development of questionnaires and balance measurements. M. Fournier conducted the analyses and assisted in interpretation. L. Gauvin actively assisted in analyses, interpretation, and write-up of the article. M. Parisien conceptualized data collection and contributed to the implementation of the study. H. Corriveau contributed to all matters related to physical performance measurements. F. Trickey specifically contributed by networking with community organizations. All authors reviewed drafts of the article.

Acknowledgments

This research was funded by the Canadian Institutes of Health Research (Health Services Research-Population and Public Health) (grant MOP 53123). It was also supported by the Montréal Public Health Department (Direction de santé publique de Montréal).

We are grateful for the dedication and support of Carole Genest, Jennifer Duplantie, and Martine Comeau, who were involved in data collection, coding, and data management. We also thank Sylvie Gauthier, who helped with revising prose and style of this article. We thank study participants who gave their time to complete questionnaires and perform balance tests. We also thank the many community organizations, interviewers, and physiotherapists who collaborated in the study.

Human Participant Protection

Ethical approval for this study was obtained from the research ethics committee of the Regional Health and Social Services Board, Montreal, Quebec.

References

1. Tinetti ME. Clinical practice. Preventing falls in elderly persons. *N Engl J Med.* 2003;348:42–49.

2. Vyrostek SB, Annest JL, Ryan GW. Surveillance for fatal and nonfatal injuries—United States, 2001. *MMWR Surveill Summ.* 2004;53:1–57.

3. de Rekeneire N, Visser M, Peila R, et al. Is a fall just a fall: correlates of falling in healthy older persons. The Health, Aging and Body Composition Study. *J Am Geriatr Soc.* 2003;51:841–846.

4. Province MA, Hadley EC, Hornbrook MC, et al. The effects of exercise on falls in elderly patients. A preplanned meta-analysis of the FICSIT Trials. Frailty and Injuries: Cooperative Studies of Intervention Techniques. *JAMA.* 1995;273:1341–1347.

5. Gardner MM, Robertson MC, Campbell AJ. Exercise in preventing falls and fall related injuries in older people: a review of randomised controlled trials. *Br J Sports Med.* 2000;34:7–17.

6. Gillespie LD, Gillespie WJ, Robertson MC, Lamb SE, Cumming RG, Rowe BH. Interventions for preventing falls in elderly people. *Cochrane Database Syst Rev.* 2003;4:CD000340.

7. Day L, Fildes B, Gordon I, Fitzharris M, Flamer H, Lord S. Randomised factorial trial of falls prevention among older people living in their own homes. *BMJ.* 2002;325:128.

8. Barnett A, Smith B, Lord SR, Williams M, Baumand A. Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial. *Age Ageing.* 2003;32:407–414.

9. Glasgow RE, Lichtenstein E, Marcus AC. Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *Am J Public Health.* 2003;93:1261–1267.

10. Duncan PW, Chandler J, Studenski S, Hughes M, Prescott B. How do physiological components of balance affect mobility in elderly men? *Arch Phys Med Rehabil.* 1993;74:1343–1349.

11. Trickey F, Parisien M, Laforest S, Genest C, Robitaille Y. STAND UP! A programme to fall for. Montréal: Direction de santé publique, Régie régionale de la santé et des services sociaux de Montréal-Centre; 2003.

12. Trickey F, Robitaille Y, Laforest S, Gosselin C, Parisien M. Prévenir les chutes chez les aînés: évaluation du programme PIED. Rapport synthèse. Montréal: Direction de la santé publique de Montréal-Centre, Régie régionale de la santé et des services sociaux; 1999.

13. Franchignoni F, Tesio L, Martino MT, Ricupero C. Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. *Aging (Milano).* 1998;10:26–31.

14. MacKnight C, Rockwood K. Assessing mobility in elderly people. A review of performance-based measures of balance, gait and mobility for bedside use. *Rev Clin Gerontol.* 1995;5:464–486.

15. El Kashlan HK, Shepard NT, Asher AM, Smith-Wheelock M, Telian SA. Evaluation of clinical measures of equilibrium. *Laryngoscope*. 1998;108:311–319.

16. Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. *J Gerontol*. 1990;45:M192–M197.

17. Brauer S, Burns Y, Galley P. Lateral reach: a clinical measure of medio-lateral postural stability. *Physiother Res Int*. 1999;4:81–88.

18. Newton RA. Balance screening of an inner city older adult population. *Arch Phys Med Rehabil*. 1997;78:587–591.

19. Dargent-Molina P, Favier F, Grandjean H, et al. Fall-related factors and risk of hip fracture: the EPIDOS prospective study. *Lancet*. 1996;348:145–149.

20. Bohannon RW. Sit-to-stand test for measuring performance of lower extremity muscles. *Percept Mot Skills*. 1995;80:163–166.

21. Ostchega Y, Harris TB, Hirsch R, Parsons VL, Kington R, Katzoff M. Reliability and prevalence of physical performance examination assessing mobility and balance in older persons in the US: data from the Third National Health and Nutrition Examination Survey. *J Am Geriatr Soc*. 2000;48:1136–1141.

22. Smidt GL. *Gait in Rehabilitation*. New York: Churchill Livingston, 1990.

23. Mathiowetz V. Reliability and validity of grip and pinch strength measurements. *Phys Rehabil Med*. 1991;2:201–212.

24. Desrosiers J, Bravo G, Hebert R, Dutil E. Normative data for grip strength of elderly men and women. *Am J Occup Ther*. 1995;49:637–644.

25. Weiner DK, Bongiorni DR, Studenski SA, Duncan PW, Kochersberger GG. Does functional reach improve with rehabilitation? *Arch Phys Med Rehabil*. 1993;74:796–800.

26. Bellerose C, Lavallée C, Chénard L, Levasseur M. Et la santé, ça va en 1992–1993? Rapport de l'Enquête sociale et de santé 1992–1993, volume 1. Montréal: Santé Québec, ministère de la Santé et des Services sociaux, Gouvernement du Québec; 1995.

27. O'Loughlin JL, Robitaille Y, Boivin JF, Suissa S. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. *Am J Epidemiol*. 1993;137:342–354.

28. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care*. 1992;30:473–483.

29. Powell LE, Myers AM. The Activities-specific Balance Confidence (ABC) Scale. *J Gerontol A Biol Sci Med Sci*. 1995;50A:M28–M34.

30. Stewart AL, Mills KM, King AC, Haskell WL, Gillis D, Ritter PL. CHAMPS physical activity questionnaire for older adults: outcomes for interventions. *Med Sci Sports Exerc*. 2001;33:1126–1141.

31. SPSS for Windows, Rel. 11.01. Chicago: SPSS Inc; 2001.

32. Suzuki T, Kim H, Yoshida H, Ishizaki T. Randomized controlled trial of exercise intervention for the prevention of falls in community-dwelling elderly Japanese women. *J Bone Miner Metab*. 2004;22:602–611.

33. Victora CG, Habicht JP, Bryce J. Evidence-based public health: moving beyond randomized trials. *Am J Public Health*. 2004;94:400–405.

34. Habicht JP, Victora CG, Vaughan JP. Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact. *Int J Epidemiol*. 1999;28:10–18.

35. American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Med Sci Sports Exerc*. 1998;30:975–991.

36. Chang JT, Morton SC, Rubenstein LZ, et al. Interventions for the prevention of falls in older adults: systematic review and meta-analysis of randomised clinical trials. *BMJ*. 2004;328:680.

Filiatrault Johanne

From: [redacted]
Sent: 10 août 2007 16:39
To: Filiatrault Johanne
Subject: FW: Permission to include a paper in an appendix of a doctoral thesis

Dear Johanne Filiatrault,
Thank you for your permissions request. The American Public Health Association is pleased to grant permission for the use of material as specified below. Full credit should be given to APHA as the source. We recommend a format similar to the following: "Reprinted with permission from the American Public Health Association." There is no fee. Please print this out for your records and let me know if I can be of further assistance.
Sincerely,

Maya Ribault, Editorial Assistant
American Journal of Public Health
American Public Health Association
800 I Street, NW
Washington, DC 20001-3710
Tel. 202/777-2465
Fax 202/777-2531
[redacted]

> -----Original Message-----
> From: Filiatrault Johanne [redacted]
> Sent: Thursday, August 09, 2007 4:49 PM
> To: Maya Ribault
> Subject: Permission to include a paper in an appendix of a doctoral
> thesis
> Importance: High
>
>
>
> Dear coordinator,
>
> By this email, I would like to request your permission to include in an appendix of my doctoral thesis, a paper published by my colleagues in 2005 in the American Journal of Public Health.
>
>
>
> I am currently in the process of writing my doctoral thesis at the University of Montreal (in Public Health) on the impact of a falls prevention program (called Stand Up!) on falls-related psychological factors among community-dwelling seniors. My thesis is part of a larger effectiveness study conducted by Dr. Yvonne Robitaille in Montreal, Canada.
>
>
>
> In 2005, Dr. Robitaille and her research team examined the impact of Stand Up! falls prevention program on participants> '> balance. They published their findings in the November 2005 issue of the American Journal of Public Health. The complete reference of this paper is the following:
>
>
>
> Robitaille, Y., Laforest, S., Fournier, M., Gauvin, L., Parisien, M., Corriveau, H., Trickey, F, & Damestoy, N. (2005). Moving Forward in Fall Prevention: An Intervention to Improve Balance Among Older Adults in Real-World Settings. American Journal of Public Health, 95(11): 2049-2056.
>
>

>
> Since my doctoral research is related to the larger investigation led by Dr. Robitaille regarding the effectiveness of Stand Up!, it would be relevant to include the paper published by Dr. Robitaille and her colleagues in an appendix of my doctoral thesis. My doctoral thesis should be completed by the end of August 2007.
>
>
>
> I look forward to your response.
>
>
>
> Sincerely yours,
>
>
>
> Johanne Filiatrault, O.T.(C), M.Sc., Ph.D. Candidate
>
> Clinical Adjunct Professor
>
> Université de Montréal
>
> C.P. 6128, succursale Centre-ville
>
> Montreal (Quebec), Canada, H3C 3J7
>
> Phone: (514) 343-6111 (ext. 0836)
>
> Fax: (514) 343-2105
>
> [redacted]
>
>
>
>
>
>
>
>

ANNEXE 2

Grille d'aptitude aux exercices
du programme PIED

Grille d'aptitude aux exercices du programme P.I.E.D.

Programme Intégré d'Équilibre Dynamique

Cette grille aide à évaluer la capacité des aînés à participer aux exercices de façon sécuritaire et profitable. Elle ne prend que quelques minutes à remplir. Demander aux participants de répondre le plus fidèlement possible.

Nom : ______________________________ Date de naissance : __________________

Évaluateur : ______________________________ Date : __________________

Organisme : ____

SECTION 1		OUI	NON
Q 1	Êtes-vous capable de marcher deux coins de rue sans devenir essoufflé ou fatigué au point de devoir vous asseoir ?	☐	☐
Q 2	Êtes-vous capable de rester en équilibre sur une jambe pendant deux secondes (essayez) ?	☐	☐
Q 3	Êtes-vous capable de monter 10 marches d'escalier ?	☐	☐

Aucun, ou 1 NON → **Passez à la section 2**

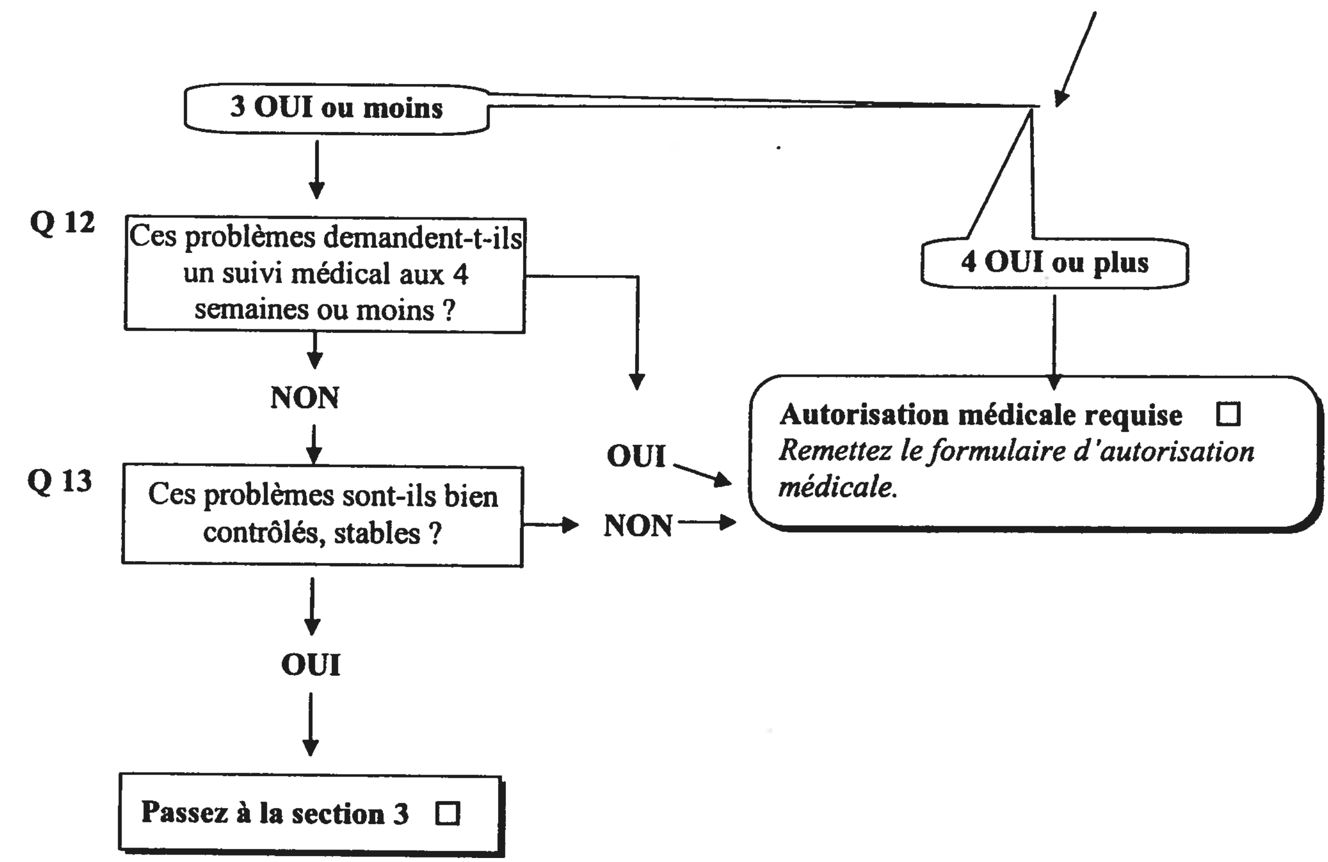
2 NON → **Autorisation médicale requise** ☐
Remettez le formulaire d'autorisation médicale.

3 NON →

Refusé ☐
Le programme P.I.E.D. est trop intensif
Orientez la personne vers des programmes mieux adaptés : (Viactive, tai chi) et conseillez-lui d'informer son médecin s'il ignore l'existence de ces problèmes.

SECTION 2

	À votre connaissance, avez-vous un ou des problèmes parmi les suivants ?	OUI	NON
Q 4	Problème cardiaque, lequel ?	☐	☐
Q 5	Haute ou basse pression	☐	☐
Q 6	Problème respiratoire (asthme, maladie pulmonaire chronique, etc.)	☐	☐
Q 7	Diabète	☐	☐
Q 8	Problème de glande thyroïde	☐	☐
Q 9	Problème articulaire ou musculaire, (arthrite, arthrose, ostéoporose, prothèse articulaire), lequel ?	☐	☐
Q 10	Vertige, perte d'équilibre, étourdissement	☐	☐
Q 11	Quel est votre poids ? ________ Quel est votre taille ? ________ La personne a-t-elle un poids excessif ? (voir le graphique en annexe)	☐	☐



SECTION 3

Q 14 Au cours des six derniers mois, avez-vous fait, au moins 2 fois par semaine, de l'exercice tels: tai chi, danse, natation, gymnastique douce ?

OUI → **ACCEPTÉ**

NON → **Q 16** Avez-vous vu votre médecin de famille au cours de la dernière année ?

OUI → **ACCEPTÉ**

NON → **Autorisation médicale requise** ☐
Remettez le formulaire d'autorisation médicale.

SECTION 4 Informations complémentaires

Q 15 Utilisez-vous une aide à la marche ?

Non ☐
Oui ☐ → canne ☐
marchette ☐

Q 16 Avez-vous d'autres problèmes de santé dont il faudrait tenir compte pendant les exercices ?

____

____

Q 17 Avez-vous fait une chute au cours des 12 derniers mois ?

Non ☐
Oui ☐ **combien ?** ____________________

Q 18 Craignez-vous de chuter ?

très souvent ☐ souvent ☐ occasionnellement ☐ jamais ☐

Q 19 Seriez-vous capable de vous rendre, 2 fois par semaine, au centre ____________________ sans être accompagné ?

Non ☐
Oui ☐

ANNEXE 3

Certificat d'approbation de l'étude principale par le comité d'éthique de la Régie régionale de la Santé et des Services sociaux

RÉGIE RÉGIONALE
DE LA SANTÉ ET DES
SERVICES SOCIAUX
DE MONTRÉAL-CENTRE

Le 13 novembre 2001

Madame Marie-Lynne Boudreau
Institut de Recherche en Santé du Canada
410, avenue Laurier Ouest, 9[ème] étage
Ottawa (Ontario)
K1A 0W9

Objet : Certificat d'approbation de projet
Projet 93357, Concours 200109MOP

Madame,

Veuillez trouver, ci joint, une copie du certificat d'approbation de projet émit par le Comité d'éthique de la recherche de la Régie régionale de la Santé et des services sociaux de Montréal-Centre, concernant le projet intitulé « Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire en vue de réduire les chutes et leurs séquelles chez les aînés ».

Espérant le tout à votre entière satisfaction recevez, Madame, mes salutations distinguées.

[redacted]

Yvonne Robitaille
Épidémiologiste
Équipe Sécurité
YR/nd

Pièce jointe

Cc. :Francine Trickey,, responsable par intérim de l'unité Écologie humaine et sociale

Écologie humaine et sociale
1301, rue Sherbrooke Est
Montréal (Québec) H2L 1M3
Téléphone : (514) 528-2400
Télécopieur : (514) 528-2426
http://www.santepub-mtl.qc.ca

HMR Hôpital Maisonneuve-Rosemont
Centre affilié à l'Université de Montréal

DIRECTION
DE LA SANTÉ
PUBLIQUE

Garder notre
monde en santé

Et à la condition que :

1. Le projet reçoive une évaluation scientifique favorable de l'organisme subventionnaire,
2. Le formulaire de consentement soit modifié de la façon suivante :
   a) indiquer qui sera le dépositaire des données,
   b) donner le nom et le numéro de téléphone d'une personne non membre de l'équipe de recherche à qui commentaires ou plaintes peuvent être acheminées (le président du CÉR peut jouer ce rôle),
   c) identifier le montant de 20 $ comme « rémunération symbolique »,

le comité d'éthique conclut que le projet soumis respecte les normes généralement acceptées pour ce genre de recherche.
Le présent certificat est valide pour une année.

Il est entendu que les chercheurs :

1) respecteront tous les engagements pris dans les documents ci-haut mentionnés;
2) préviendront le comité d'éthique de tout changement au protocole ou à la formule de consentement pouvant avoir des répercussions éthiques;
3) lui rapporteront tout incident important survenant lors de l'étude;
4) lui fourniront les renseignements demandés pour le suivi éthique de l'étude.

Le chercheur fournira au CÉR un bref rapport intérimaire au plus tard dans un an, condition nécessaire à un éventuel renouvellement annuel du présent certificat. Le chercheur enverra aussi au comité une copie du rapport final des résultats de l'étude lorsqu'elle sera terminée.

[redacted]

Président du comité

1er novembre 2001

Date

RÉGIE RÉGIONALE
DE LA SANTÉ ET DES
SERVICES SOCIAUX
DE MONTRÉAL-CENTRE

APPROBATION DE PROJET
PAR LE COMITÉ D'ÉTHIQUE DE LA RECHERCHE

Le Comité d'éthique de la recherche de la Régie régionale de la santé et des services sociaux de Montréal-Centre a examiné le projet de recherche intitulé :

« Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire en vue de réduire les chutes et leurs séquelles chez les aînés », version révisée,

soumis par : Yvonne Robitaille, chercheure principale,

lors de sa réunion du 18 octobre 2001, au 1301 rue Sherbrooke Est, Montréal, H2L 1M3.

Membres du comité:

Dr. Robert Allard	*Médecin-conseil, DSP et président du comité*
M. Alex Battaglini	*Anthropologue, DSP*
Dr. Jean-Marc Brodeur	*Professeur, Université de Montréal*
Dr. Bernard Heneman	*Médecin-conseil, DSP*
Me Marie Hirtle	*Avocate*
M. Marc-Léo Laroche	*Représentant du conseil d'administration*
Me Jean-Philippe Lavoie	*Avocat et vice-président du comité*
Mme Marie-Françoise Llaume-el-Khouri	*Membre citoyen*
Mme Marcelle Monette	*Sans droit de vote*
Mme Èvelyne Racette	*Membre citoyen*
Dr. Robert Simard	*Médecin-conseil, DSP*
M. Claudio Zanchettin	*Membre citoyen*

Sur la foi des documents suivants :

1. Votre protocole du 22 septembre 2001 et ses annexes,
2. Le formulaire de soumission de projet,

Maladies infectieuses
1301, rue Sherbrooke Est
Montréal (Québec) H2L 1M3
Téléphone : (514) 528-2400
Télécopieur : (514) 528-2452
http://www.santepub-mtl.qc.ca

Hôpital général de Montréal
mandataire

DIRECTION
DE LA SANTÉ
PUBLIQUE

ANNEXE 4

Approbation du projet de thèse par le comité d'éthique de la Direction de santé publique de Montréal

Agence
de développement
de réseaux locaux
de services de santé
et de services sociaux
Québec
Montréal

RENOUVELLEMENT D'UN CERTIFICAT DE CONFORMITÉ ÉTHIQUE

Projet No. :	38
Intitulé :	Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire en vue de réduire les chutes et leurs séquelles chez les aînés.
Chercheurs Principaux :	Yvonne Robitaille
Date d'émission du certificat d'éthique original:	01/11/2001
Documents soumis au soutien de la demande	Rapport d'étape (12 octobre 2004); Document relatif à l'épreuve écrite dans le cadre de l'examen général de synthèse (1er septembre 2004)

Le 27 janvier 2005, le comité d'éthique de la recherche (CER) de la Direction de santé publique de Montréal a procédé à l'évaluation de la demande de renouvellement du certificat de conformité éthique ainsi que la demande d'amendement y prévue.

CONSIDÉRANT l'ajout d'un objectif de recherche;

CONSIDÉRANT la demande d'utilisation secondaire des données formulée par Johanne Filiatrault, dans le cadre du projet de thèse de doctorat intitulé : « *Évaluation de l'impact d'un programme de prévention des chutes sur la peur de chuter, la restriction d'activité et l'auto-efficacité des aînés en regard de l'équilibre* »

CONSIDÉRANT la demande de dispense formulée par Mme Filiatrault à l'égard de l'obtention du consentement des participants au projet PIED pour l'utilisation secondaire des données pour les fins de son projet de thèse;

CONSIDÉRANT que le projet de thèse se limite à l'utilisation secondaire des données et ne requiert pas que les participants soient recontactés;

CONSIDÉRANT que la dénominalisation des données confère aux participants du projet de recherche original, suffisamment de garanties eu égard à la confidentialité des données et la protection de leur vie privée;

CONSIDÉRANT que les participants du projet de recherche principal n'encourront aucun risque additionnel du fait des travaux de Mme Filiatrault;

CONSIDÉRANT que les travaux de Mme Filiatrault ont un tel lien de connexité avec le projet de recherche principal qu'ils sont, en pratique, couverts par le consentement initial des participants;

CONSIDÉRANT les exigences de l'*Énoncé de politique des trois Conseils: Éthique de la recherche avec des êtres humains* (1998), particulièrement les règles 3.3 et suivantes;

Le CER, en vertu de sa procédure accélérée, **APPROUVE** l'utilisation secondaire des données demandée par Mme Filiatrault et, par voie de conséquence, l'amendement au projet de recherche No. 38.

Le certificat éthique émis dans le cadre du projet 38 est donc renouvelé pour une période d'un an à compter des présentes.

IL EST ENTENDU QUE LES CHERCHEURS :

1) respecteront tous les engagements pris lors de l'approbation initiale ou subséquemment;
2) préviendront le comité d'éthique de tout changement au protocole ou à la formule de consentement pouvant avoir des répercutions éthiques;
3) lui rapporteront tout incident important survenant lors de l'étude;
4) lui fourniront les renseignements demandés pour le suivi éthique de l'étude;
5) fourniront au CER un bref rapport intérimaire au plus tard dans un an, condition nécessaire à un autre renouvellement annuel du présent certificat, si nécessaire;
6) enverront au comité une copie du rapport final des résultats de l'étude lorsqu'elle sera terminée.

En acceptant le présent certificat, les chercheurs acceptent toutes les conditions qu'il comporte.

[redacted]

Me Sébastien Lormeau
Président du CER

4 février 2005
Date

ANNEXE 5

Formulaires de consentement des participants du groupe expérimental et du groupe témoin

FORMULAIRE DE CONSENTEMENT : GROUPE AVEC PROGRAMME

Titre du projet de recherche :

Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire, en vue de réduire les chutes chez les aînés

Nom des chercheurs :

Robitaille, Yvonne,	Direction de la santé publique Montréal-Centre
Laforest, Sophie	Direction de la santé publique Montréal-Centre
Trickey, Francine,	Direction de la santé publique Montréal-Centre
Nault, Serge,	Direction de la santé publique Montréal-Centre
Damestoy, Nicole,	Direction de la santé publique de Laval
Gauvin, Lise,	Université de Montréal
Corriveau, Hélène	Université de Sherbrooke

Nom de l'organisme subventionnaire :

Instituts de recherche en santé du Canada

EN QUOI CONSISTE CETTE RECHERCHE ?

La recherche a pour but d'étudier les changements de l'équilibre et de la force chez des aînés qui participent à un programme d'exercices physiques et chez d'autres qui n'y participent pas.

QUELS SONT LES OBJECTIFS VISÉS ?

La recherche va permettre de connaître :

- comment le programme, qui vise à réduire les risques de chute et de fracture, est accepté par les aînés;
- l'intérêt et la participation des aînés aux exercices en groupe et à la maison;
- les effets du programme sur l'équilibre, sur la force musculaire et sur le bien-être des aînés participants;
- le type d'activités qui permet de maintenir un meilleur équilibre et une plus grande force après la fin du programme.

EN QUOI CONSISTE VOTRE PARTICIPATION ?

Vous avez déjà répondu par téléphone à quelques questions pour évaluer dans quelle mesure votre santé vous permet de faire certains exercices physiques. À partir de maintenant, vous aurez à passer une série de tests pour mesurer votre équilibre et votre force musculaire.

Ces tests seront faits quatre fois durant l'année : avant le début du programme, immédiatement après le programme, puis six mois et un an après la première évaluation. Ils seront administrés par des physiothérapeutes. Ces tests sont simples et ils ne sont pas douloureux. Par exemple, vous devrez vous tenir sur une jambe durant quelques secondes ou encore, vous asseoir et vous relever d'une chaise plusieurs fois de suite. Lors de ces tests, vous aurez aussi à répondre à un questionnaire portant sur votre santé, sur votre qualité de vie et sur d'autres aspects, comme le type d'activités physiques que vous faites. Un montant de $10 vous sera remis à chaque évaluation comme rémunération symbolique pour vos déplacements et le temps requis par les tests.

EN QUOI CONSISTE LA RECHERCHE ET LE PROGRAMME ?

Les participants à la recherche sont divisés en deux groupes : un groupe qui recevra le programme prochainement (expérimental) et un groupe qui ne recevra cette année que les tests (témoin).

Comme vous êtes dans le **groupe expérimental**, vous participerez bientôt à un programme d'exercices d'une durée d'environ 12 semaines, qui comprend :

- à chaque semaine, deux rencontres d'exercices physiques en groupe, d'une durée d'une heure à chaque fois;
- à chaque semaine, une rencontre de discussion concernant la prévention des chutes et des fractures, d'une durée de 30 minutes à chaque fois;
- une trousse, qui vous sera remise pour vous aider à pratiquer des exercices seul à la maison, au moins une fois par semaine.

Ce programme se nomme P.I.E.D. (Programme intégré d'équilibre dynamique).

QUELS SONT LES INCONVÉNIENTS À PARTICIPER À CETTE RECHERCHE ?

Votre participation à cette recherche implique d'avoir à vous déplacer quatre fois pour passer une série de tests pour mesurer vos capacités physiques et pour répondre à un questionnaire. Ces séances dureront environ une heure trente.

Lors de votre participation au programme d'exercices, il se peut que vous ressentiez des courbatures après les premières séances. Les professionnels qui animent ces séances vous aideront à doser les exercices de façon à limiter ces inconforts.

Les personnes qui deviennent plus actives peuvent de ce fait même être plus exposées à des risques de chute. Toutefois, ces risques sont compensés par les bénéfices que procure l'activité physique. Au total, les risques de chute associés au programme sont probablement moindres que ceux encourus par une personne sédentaire.

QUELS SONT LES AVANTAGES À PARTICIPER À CETTE RECHERCHE ?

Cette recherche représentera pour vous l'occasion :

- de participer à un nouveau programme d'exercices physiques conçu et supervisé par des experts, visant à augmenter votre équilibre, votre force et votre bien-être;
- d'obtenir, si vous le désirez, certains résultats des évaluations de vos capacités physiques faites par des professionnels après la quatrième évaluation.

De plus, vous aurez contribué à une recherche qui fournira de précieuses informations sur les programmes d'exercices et sur les façons efficaces pour agir sur les risques de chute et de fracture chez les aînés.

QUELS SONT VOS DROITS ?

Vous avez **en tout temps** le droit absolu de refuser de répondre à toute question et de cesser, sans aucune conséquence, de participer à cette recherche.

AUREZ-VOUS ACCÈS AUX RÉSULTATS DE CETTE RECHERCHE ?

Vous recevrez, si vous le souhaitez, un résumé des résultats de ce projet de recherche.

QUELS SONT NOS ENGAGEMENTS POUR ASSURER LA CONFIDENTIALITÉ ?

Tout le personnel de l'équipe de recherche a signé un formulaire d'engagement à la confidentialité afin de protéger l'information que vous nous communiquerez. Seuls les membres de l'équipe de recherche auront accès à cette information. Tous les documents seront détenus à la Direction de la santé publique de Montréal-Centre,1301, rue Sherbrooke Est, Montréal, H2L 1M3. Nous éliminerons des documents toute donnée qui permettraient de vous identifier.

Pour tout renseignement sur le projet de recherche, veuillez communiquer avec :

Manon Parisien, coordonnatrice, (514) 528-2400, poste 3315
Yvonne Robitaille, chercheur, (514) 528-2400, poste 3365.

Si vous souhaitez adresser des commentaires favorables ou défavorables à une personne qui n'est pas membre de l'équipe de recherche, veuillez les acheminer au Dr Robert Allard au 528-2400 poste 3689.

Merci de votre participation

Veuillez garder une copie de ce formulaire pour vous y référer au besoin.

Formulaire de signature

Votre signature atteste que vous avez compris les renseignements concernant votre participation à cette recherche et indique que vous acceptez d'y participer. Elle ne signifie pas que vous cédez vos droits ou que vous libérez les chercheurs et leurs collaborateurs de leurs responsabilités juridiques ou professionnelles. Vous ne devez jamais hésiter à demander des éclaircissements au cours du projet. Vous êtes libre de vous retirer **en tout temps** de l'étude sans aucune conséquence pour vous.

Signatures

Nom du participant	Signature	Date
Représentant de l'équipe de recherche (Témoin)	Signature	Date

Ma signature atteste que je garantis le respect des mesures énoncées dans ce formulaire qui visent à assurer la confidentialité de toute l'information que vous donnerez.

Yvonne Robitaille, chercheur principal	Date

Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire, en vue de réduire les chutes chez les aînés

Formulaire de signature

Votre signature atteste que vous avez compris les renseignements concernant votre participation à cette recherche et indique que vous acceptez d'y participer. Elle ne signifie pas que vous cédez vos droits ou que vous libérez les chercheurs et leurs collaborateurs de leurs responsabilités juridiques ou professionnelles. Vous ne devez jamais hésiter à demander des éclaircissements au cours du projet. Vous êtes libre de vous retirer **en tout temps** de l'étude sans aucune conséquence pour vous.

Signatures

Nom du participant	Signature	Date
Représentant de l'équipe de recherche (Témoin)	Signature	Date

Ma signature atteste que je garantis le respect des mesures énoncées dans ce formulaire qui visent à assurer la confidentialité de toute l'information que vous donnerez.

Yvonne Robitaille, chercheur principal	Date

FORMULAIRE DE CONSENTEMENT : GROUPE TÉMOIN

Titre du projet de recherche :

Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire, en vue de réduire les chutes chez les aînés

Nom des chercheurs :

Robitaille Yvonne,	Direction de la santé publique Montréal-Centre
Laforest Sophie	Direction de la santé publique Montréal-Centre
Trickey Francine,	Direction de la santé publique Montréal-Centre
Nault Serge,	Direction de la santé publique Montréal-Centre
Damestoy Nicole,	Direction de la santé publique de Laval
Gauvin Lise,	Université de Montréal
Corriveau Hélène	Université de Sherbrooke

Nom de l'organisme subventionnaire :

Instituts de recherche en santé du Canada

EN QUOI CONSISTE CETTE RECHERCHE?

La recherche a pour but d'étudier les changements de l'équilibre et de la force, chez des aînés qui participent à un programme d'exercices physiques et chez d'autres qui n'y participent pas.

QUELS SONT LES OBJECTIFS VISÉS?

La recherche va permettre de connaître :

- comment un programme, qui vise à réduire les risques de chute et de fracture, est accepté par les aînés;
- l'intérêt et la participation des aînés aux exercices en groupe et à la maison;
- les effets du programme sur l'équilibre, sur la force musculaire et sur le bien-être des aînés participants;
- le type d'activités qui permet de maintenir un meilleur équilibre et une plus grande force après la fin du programme.

EN QUOI CONSISTE VOTRE PARTICIPATION À CETTE RECHERCHE ?

Vous avez déjà répondu par téléphone à quelques questions pour évaluer dans quelle mesure votre santé vous permet de faire certains exercices physiques. À partir de maintenant, vous aurez à passer une série de tests pour mesurer votre équilibre et votre force musculaire. Ces tests seront faits quatre fois durant l'année : aujourd'hui, dans douze semaines, dans six mois et dans un an. Ils seront administrés par des physiothérapeutes. Ces tests sont simples et ils ne sont pas douloureux. Par exemple, vous devrez vous tenir sur une jambe durant quelques secondes ou encore, vous asseoir et vous relever d'une chaise plusieurs fois de suite.

Lors de ces tests, vous aurez aussi à répondre à un questionnaire portant sur votre santé, sur votre qualité de vie et sur d'autres aspects, comme le type d'activités physiques que vous faites. Un montant de $10 vous sera remis à chaque évaluation comme rémunération symbolique pour vos déplacements et le temps requis par les tests.

EN QUOI CONSISTENT LA RECHERCHE ET LE PROGRAMME?

Les participants à la recherche sont divisés en deux groupes : un groupe qui recevra le programme prochainement (expérimental) et un groupe qui ne recevra cette année, que les tests (témoin).

Comme vous faites partie du **groupe témoin**, seule votre participation aux tests et aux questionnaires sera requise. Le programme qui pourrait être offert par votre organisme l'année prochaine est d'une durée d'environ 12 semaines et vous pourriez y avoir accès. Il se nomme PIED (Programme intégré d'équilibre dynamique). Il comprend chaque semaine, deux rencontres d'exercices en groupe, une rencontre de discussion et une trousse d'exercices à faire à la maison.

QUELS SONT LES INCONVÉNIENTS À PARTICIPER À CETTE RECHERCHE?

Votre participation à cette recherche implique d'avoir à vous déplacer quatre fois pour passer une série de tests pour mesurer vos capacités physiques et pour répondre à un questionnaire. Ces séances dureront environ une heure trente.

QUELS SONT LES AVANTAGES À PARTICIPER À CETTE RECHERCHE?

Cette recherche représentera pour vous l'occasion d'obtenir, après la quatrième évaluation si vous le désirez, certains résultats des évaluations de vos capacités physiques faites par des professionnels.

De plus, vous aurez contribué à une recherche qui fournira de précieuses informations sur les programmes d'exercices et sur les façons efficaces pour agir sur les risques de chute et de fracture chez les aînés.

QUELS SONT VOS DROITS ?

Vous avez **en tout temps** le droit absolu de refuser de répondre à toute question et de cesser, sans aucune conséquence, de participer à cette recherche.

AUREZ-VOUS ACCÈS AUX RÉSULTATS DE CETTE RECHERCHE?

Vous recevrez, si vous le souhaitez, un résumé des résultats de ce projet de recherche.

QUELS SONT NOS ENGAGEMENTS POUR ASSURER LA CONFIDENTIALITÉ?

Tout le personnel de l'équipe de recherche a signé un formulaire d'engagement à la confidentialité afin de protéger l'information que vous nous communiquerez. Seuls les membres de l'équipe de recherche auront accès à cette information. Tous les documents seront détenus à la Direction de la santé publique de Montréal-Centre, 1301, rue Sherbrooke Est, Montréal, H2L 1M3. Nous éliminerons des documents toute donnée qui permettraient de vous identifier.

Pour tout renseignement sur le projet de recherche, veuillez communiquer avec :

Manon Parisien, coordonnatrice, (514) 528-2400, poste 3315
Yvonne Robitaille, chercheur, (514) 528-2400, poste 3365.

Si vous souhaitez adresser des commentaires favorables ou défavorables à une personne qui n'est pas membre de l'équipe de recherche, veuillez les acheminer au Dr Robert Allard au 528-2400 poste 3689.

Merci de votre participation

Veuillez garder une copie de ce formulaire pour vous y référer au besoin.

Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire, en vue de réduire les chutes chez les aînés

Formulaire de signature

Votre signature atteste que vous avez compris les renseignements concernant votre participation à cette recherche et indique que vous acceptez d'y participer. Elle ne signifie pas que vous cédez vos droits ou que vous libérez les chercheurs et leurs collaborateurs de leurs responsabilités juridiques ou professionnelles. Vous ne devez jamais hésiter à demander des éclaircissements au cours du projet. Vous êtes libre de vous retirer **en tout temps** de l'étude sans aucune conséquence pour vous.

Signatures

Nom du participant	Signature	Date
Représentant de l'équipe de recherche (Témoin)	Signature	Date

Ma signature atteste que je garantis le respect des mesures énoncées dans ce formulaire et qui visent à assurer la confidentialité de toute l'information que vous donnerez.

Yvonne Robitaille, chercheur principal	Date

Évaluation d'un programme d'amélioration de l'équilibre en milieu communautaire, en vue de réduire les chutes chez les aînés

Formulaire de signature

Votre signature atteste que vous avez compris les renseignements concernant votre participation à cette recherche et indique que vous acceptez d'y participer. Elle ne signifie pas que vous cédez vos droits ou que vous libérez les chercheurs et leurs collaborateurs de leurs responsabilités juridiques ou professionnelles. Vous ne devez jamais hésiter à demander des éclaircissements au cours du projet. Vous êtes libre de vous retirer **en tout temps** de l'étude sans aucune conséquence pour vous.

Signatures

Nom du participant	Signature	Date
Représentant de l'équipe de recherche (Témoin)	Signature	Date

Ma signature atteste que je garantis le respect des mesures énoncées dans ce formulaire et qui visent à assurer la confidentialité de toute l'information que vous donnerez.

Yvonne Robitaille, chercheur principal	Date

ANNEXE 6

Approbation des coauteurs

Santé publique

Programme de Ph.D. – Santé publique

Accord des coauteurs

IDENTIFICATION

Nom de l'étudiant	Code permanent
Johanne Filiatrault	[redacted]

UNITÉ ACADÉMIQUE

Faculté	Nom du programme	Sigle	Option
Médecine	Ph.D. - Santé publique	3-481-1-1	Promotion de la santé

DESCRIPTION DE L'ARTICLE

Titre de l'article :	A systematic review of fall-related psychological outcomes of interventions among community-dwelling seniors
Nom des auteurs :	Johanne Filiatrault, Lise Gauvin, Sophie Laforest, Yvonne Robitaille, Lucie Richard, Hélène Corriveau
Revue pressentie pour publication :	Journal of Epidemiology and Community Health
Date prévue de publication :	2008
État du cheminement :	ARTICLE : ☐ publié ☐ accepté ☐ soumis ☑ en préparation
Autres détails :	

DÉCLARATION

À titre de coauteur(e) de l'article identifié ci-dessus, je suis d'accord pour que : Johanne Filiatrault inclue cet article dans sa thèse de doctorat, laquelle a pour titre : Facteurs psychologiques associés aux chutes chez les aînés: conceptualisation mesure et impact d'un programme communautaire de prévention des chutes

Coauteur(e)	Signature	Date
Lise Gauvin	[redacted]	30-08-07
Sophie Laforest		10-7-7
Yvonne Robitaille		10-07-2007
Lucie Richard		03-08-07
Hélène Corriveau		29-08-07

CONSERVER UNE COPIE POUR LE DOSSIER DE L'ÉTUDIANT

SP-2007

Santé publique

Programme de Ph.D. – Santé publique

Accord des coauteurs

IDENTIFICATION

Nom de l'étudiant	Code permanent
Johanne Filiatrault	[redacted]

UNITÉ ACADÉMIQUE

Faculté	Nom du programme	Sigle	Option
Médecine	*Ph.D. - Santé publique*	3-481-1-1	Promotion de la santé

DESCRIPTION DE L'ARTICLE

Titre de l'article :	Implementing a community-based falls prevention program: From drawing board to reality
Nom des auteurs :	Johanne Filiatrault, Manon Parisien, Sophie Laforest, Carole Genest, Lise Gauvin, Michel Fournier, Francine Trickey, Yvonne Robitaille
Revue pressentie pour publication :	Canadian Journal on Aging, Volume 26, Numéro 3
Date prévue de publication :	Automne 2007
État du cheminement :	ARTICLE : ☐ publié ☑ accepté ☐ soumis ☐ en préparation
Autres détails :	Sous presse.

DÉCLARATION

À titre de coauteur(e) de l'article identifié ci-dessus, je suis d'accord pour que : Johanne Filiatrault inclue cet article dans sa thèse de doctor[redacted] Facteurs psychologiques associés aux chutes chez les aînés: conceptualisation, mesure et impact d'un programme communautaire de prévention des chutes

Coauteur(e)	Signature	Date
Manon Parisien	[redacted]	21-08-07
Sophie Laforest		10-07-07
Carole Genest		14-08-07
Lise Gauvin		30-08-07
Michel Fournier		10-07-07
Francine Trickey		21-08-07
Yvonne Robitaille		10 juil. 2007

CONSERV[redacted] COPIE POUR LE DOSSIER DE L'ÉTUDIANT

Santé publique

Programmes de Ph.D. – Santé publique

Accord des coauteurs

IDENTIFICATION

Nom de l'étudiant	Code permanent
Johanne Filiatrault	[redacted]

UNITÉ ACADÉMIQUE

Faculté	Nom du programme	Sigle	Option
Médecine	Ph.D. – Santé publique	3-481-1-1	Promotion de la santé

DESCRIPTION DE L'ARTICLE

Titre de l'article :	Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence scale for community-dwelling seniors
Nom des auteurs :	Johanne Filiatrault, Lise Gauvin, Michel Fournier, Manon Parisien, Yvonne Robitaille, Sophie Laforest, Hélène Corriveau, Lucie Richard
Revue proposée pour publication :	Archives of Physical Medicine and Rehabilitation, volume 88, numéro 5, pages 564 à 672.
Date prévue de publication :	Publié en mai 2007
État du cheminement :	ARTICLE : ☑ publié ☐ accepté ☐ soumis ☐ en préparation
Autres détails :	

DÉCLARATION

Facteurs psychologiques associés aux chutes chez les aînés: conceptualisation, mesure et impact d'un programme communautaire de prévention des chutes

A titre de coauteur(s) de l'article identifié ci-dessus, je suis d'accord pour que : Johanne Filiatrault
inclue cet article dans sa thèse de doctorat [redacted]

Coauteur(s)	Signature	Date
Lise Gauvin	[redacted]	30/08/07
Michel Fournier	[redacted]	12/07/07
Manon Parisien	[redacted]	21-08-07
Yvonne Robitaille	[redacted]	10 juil 2007
Sophie Laforest	[redacted]	10/07/7
Hélène Corriveau	[redacted]	29/08/07
Lucie Richard	[redacted]	03/08/07

SP-2007

Santé publique

Programme de Ph.D. - Santé publique

Accord des coauteurs

IDENTIFICATION

Nom de l'étudiant	Code permanent
Johanne Filiatrault	[redacted]

UNITÉ ACADÉMIQUE

Faculté	Nom du programme	Sigle	Option
Médecine	Ph.D. - Santé publique	3-481-1-1	Promotion de la santé

DESCRIPTION DE L'ARTICLE

Titre de l'article :	Impact of a multifaceted community-based falls prevention program on psychological factors related to falls
Nom des auteurs :	Johanne Filiatrault, Lise Gauvin, Yvonne Robitaille, Sophie Laforest, Michel Fournier, Lucie Richard, Hélène Corriveau
Revue pressentie pour publication :	Journal of Geronotoly: Psychological Sciences
Date prévue de publication :	2008
État du cheminement :	ARTICLE : ☐ publié ☐ accepté ☐ soumis ☑ en préparation
Autres détails :	

DÉCLARATION

À titre de coauteur(s) de l'article identifié ci-dessus, je suis d'accord pour que : Johanne Filiatrault
inclus cet article dans sa thèse de doctorat, [redacted]
Facteurs psychologiques associés aux chutes chez les aînés: conceptualisation mesure et impact d'un programme communautaire de prévention des chutes

Coauteur(s)	Date
Lise Gauvin	30-08-07
Yvonne Robitaille	10-07-2007
Sophie Laforest	10-7-2007
Michel Fournier	10-07-07
Lucie Richard	03-08-07
Hélène Corriveau	29-08-07

CONSERVER

SP-2007

ANNEXE 7

Approbation des éditeurs

Santé publique

Programme de Ph.D. – Santé publique

Permission de l'éditeur

IDENTIFICATION

Nom complet de la revue ou du livre :	Canadian Journal on Aging
Adresse complète :	Canadian Journal on Aging Queen's University Macintosh Corry Hall, Room E308, Kingston, Ontario, K7L 3N6
Nom de l'éditeur ou des éditeurs :	Mark Rosenberg, Ph.D.
Titre de l'article :	Implementing a community-based falls prevention program: From drawing board to reality
Nom des auteurs :	Filiatrault, J., Parisien, M., Laforest, S., Genest, C., Gauvin, L., Fournier, M., Trickey, F., Robitaille, Y.
Coordonnées :	No de la revue : 26(3) Pages initiale et finale : ____
Date de parution :	Automne 2007

AUTORISATION

L'étudiant(e) : Johanne Filiatrault est autorisé(e) à inclure l'article identifié ci-dessus dans sa thèse de doctorat, laquelle a pour titre : Facteurs psychologiques associés aux chutes chez les aînés: conceptualisation mesure et impact d'un programme communautaire de prévention des chutes

Mark Rosenberg, Ph.D.
Éditeur / éditrice

[redacted]

25/07/07
Date

Éditeur / éditrice

Signature

Date

CONSERVER UNE COPIE POUR LE DOSSIER DE L'ÉTUDIANT

SP-2007

507 255 4641

07/11/2007 WED 18:05 FAX 507 255 4641

07/11/2007 12:37 ECOLE DE READAPTATION → 912152393388

TO FAX: 1-519-343-2105
FRM: 1-507-255-8572

Santé publique

Programme de Ph.D. – Santé publique

Permission de l'éditeur

IDENTIFICATION

Nom complet de la revue ou du livre :	Archives of Physical Medicine and Rehabilitation
Adresse complète :	Editorial office 330, North Wabash Avenue, Suite 2510 Chicago, IL 60611-3604
Nom de l'éditeur ou des éditeurs :	Jeffrey R. Basford, MD, Ph.D. Editor-in-Chief
Titre de l'article :	Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors
Nom des auteurs :	Johanne Filiatrault, Lise Gauvin, Michel Fournier, Manon Parisien, Yvonne Robitaille, Sophie Laforest, Hélène Corriveau, Lucie Richard
Coordonnées :	No de la revue : 28(5) Pages initiale et finale : 664-672
Date de parution :	Mai 2007

AUTORISATION

L'étudiant(e) : Johanne Filiatrault est autorisé(e) à inclure l'article identifié ci-dessus dans sa thèse de docteur, laquelle a pour titre :

Facteurs psychologiques associés aux chutes chez les aînés: Conceptualisation, mesure et impact d'un programme communautaire de prévention des chutes

Jeffrey R. Basford, MD, Ph.D. [redacted] 11 July 2007
Éditeur / éditrice Date

Éditeur / éditrice Signature Date

CONSERVER UNE COPIE POUR LE DOSSIER DE L'ÉTUDIANT

SP-2007

ANNEXE 8

Curriculum vitae

CURRICULUM VITAE

FORMATION ET DIPLÔMES :

2007 -	**Stage postdoctoral** Centre de recherche sur le vieillissement, Institut universitaire de gériatrie de Sherbrooke
2001 -	**Ph.D. en santé publique, option « promotion de la santé » (en voie d'obtention)** Faculté de médecine, Université de Montréal
1989 -1991	**Maîtrise ès sciences (sciences neurologiques)** Département de physiologie, Faculté de médecine, Université de Montréal
1983 -1986	**Baccalauréat ès sciences (ergothérapie)** École de réadaptation, Faculté de médecine, Université de Montréal

BOURSES DE FORMATION :

Bourse postdoctorale :

2007	Bourse de formation postdoctorale du Fonds de la recherche en santé du Québec

Bourses de doctorat :

2006	Bourse de formation octroyée par l'Institut national de santé publique du Québec dans le cadre de la 10e édition des Journées annuelles de santé publique
2006	Bourse d'appui à la diffusion des résultats de recherche du Réseau québécois de recherche sur le vieillissement
2006	Bourse de rédaction octroyée par la Faculté des études supérieurs (concours *F.E.S./Ph.D. Santé publique)*
2004	Bourse de recherche Anne-Lang-Etienne octroyée par l'Ordre des ergothérapeutes du Québec
2004	Bourse de voyage du Réseau québécois de recherche sur le vieillissement
2003	Bourse de formation octroyée par l'Institut national de santé publique du Québec dans le cadre de la 7e édition des Journées annuelles de santé publique
2002	Bourse de formation du FRSQ pour détenteurs d'un diplôme professionnel en santé (doctorat)
2001	Bourse de l'équipe FCAR en promotion de la santé dans les communautés GRIS, Université de Montréal

Bourses de maîtrise :

1991	Bourse du Conseil de recherches médicales du Canada (renouvellement)
1990	Bourse du Conseil de recherches médicales du Canada (octroyée pour un an)
1990	Bourse du FRSQ (déclinée en raison des règles régissant le cumul des bourses)
1990	Bourse du FCAR (déclinée en raison des règles régissant le cumul des bourses)
1989	Bourse de l'Institut de réadaptation de Montréal
1989	Bourse d'études de Ciment St-Laurent (octroyée pour deux ans)

CARRIÈRE ACADÉMIQUE :*

2001 - 2007	Professeure adjointe de clinique École de réadaptation, Faculté de médecine, Université de Montréal
2000 - 2001	Consultante pédagogique, École de réadaptation Faculté de médecine, Université de Montréal

CARRIÈRE ACADÉMIQUE (suite) :*

1998 - 2000	Chargée de cours, École de réadaptation Faculté de médecine, Université de Montréal
1995 - 1997	Conférencière, superviseure de laboratoire, chargée de travaux pratiques et correctrice, École de réadaptation, Faculté de médecine, Université de Montréal
1995	Directrice par intérim du programme d'ergothérapie, Département d'ergothérapie, Faculté de médecine, Université Laval
1991 - 1995	Professeure assistante/professeure suppléante Département d'ergothérapie, Faculté de médecine, Université Laval
1988 – 1991	Conférencière, chargée de travaux pratiques et correctrice, École de réadaptation, Faculté de médecine, Université de Montréal

* *Octroi d'un poste de professeure adjointe à l'École de réadaptation de l'Université de Montréal prévu à la fin du doctorat.*

EXPÉRIENCE PROFESSIONNELLE À TITRE D'ERGOTHÉRAPEUTE :

2001	CLSC Châteauguay, Châteauguay, Québec
1999 - 2000	CLSC La Vallée-des-Patriotes, Beloeil, Québec
1998 - 1999	CLSC Châteauguay, Châteauguay, Québec
1987 - 1991	Institut de réadaptation de Montréal, Montréal, Québec
1987	Centre hospitalier Pierre-Boucher, Longueuil, Québec

ARTICLES SOUS PRESSE OU PUBLIÉS :

Filiatrault, J., Gauvin, L., Robitaille, Y., Laforest, S., Corriveau, H., & Richard, L. (sous presse).Impact of a multifaceted community-based falls prevention program on balance-related psychological factors. *Archives of Physical Medicine and Rehabilitation.*

Filiatrault, J., Parisien, M., Laforest, S., Genest, C., Gauvin, L., Fournier, M., Trickey, F., & Robitaille, Y. (2007). Implementing a community-based falls prevention program: From drawing board to reality. *Canadian Journal of Aging, 26*(3): 213-225.

Filiatrault, J., Gauvin, L., Fournier, M. Parisien, L., Laforest, S., Robitaille, Y., Corriveau, H., & Richard, L. (2007). Evidence of the psychometric qualities of a simplified version of the Activities-specific Balance Confidence Scale for community-dwelling seniors. *Archives of Physical Medicine and Rehabilitation, 88*(5): 664-672.

Filiatrault, J., & Richard, L. (2005). L'apport des théories des changements comportementaux aux interventions de prévention et de promotion de la santé de l'ergothérapeute. *Revue Canadienne d'Ergothérapie, 72*(1): 45-56.

ARTICLES SOUMIS OU EN PRÉPARATION :

Filiatrault, J., Gauvin, L., Laforest, S., Robitaille, Y., Richard, L., & Corriveau, H. (soumis). The impact of preventive interventions offered to community-dwelling seniors on falls-related psychological factors: A review. Soumis à la revue *Preventive Medicine*.

Laforest, S., Pelletier, A., Gauvin, L., Robitaille, Y., Fournier, M., Corriveau, H., & **Filiatrault, J.** (soumis). Impact of a community-based falls prevention program on maintenance of increased involvement in physical activity among older adults: A quasi-experimental design. Soumis à la revue *Journal of Aging and Health.*

Filiatrault, J., Pinard, C., & Richard, L. (en préparation). Toward an ecological approach to falls prevention. À soumettre à la revue *American Journal of Occupational Therapy*.

Robitaille, Y., Gauvin, L., Laforest, S., Fournier, M., Corriveau, H., & **Filiatrault, J**. (en préparation). Exploring the impact of a community-based falls prevention program offered in natural settings on falls incidence. À soumettre à la revue *American Journal of Public Health.*