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ORIGINAL ARTICLE

# Effects of a Multifactorial Fall Prevention Program on Fall Incidence and Physical Function in Community-Dwelling Older Adults With Risk of Falls

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**Abstract**

**Objective:** To evaluate effects of a multifactorial fall prevention program on fall incidence and physical function in community-dwelling older adults.

**Design:** Multicenter randomized controlled trial.

**Setting:** Three medical centers and adjacent community health centers.

**Participants:** Community-dwelling older adults (N=616) who have fallen in the previous year or are at risk of falling.

**Interventions:** After baseline assessment, eligible subjects were randomly allocated into the intervention group (IG) or the control group (CG), stratified by the Physiological Profile Assessment (PPA) fall risk level. The IG received a 3-month multifactorial intervention program including 8 weeks of exercise training, health education, home hazards evaluation/modification, along with medication review and ophthalmology/other specialty consults. The CG received health education brochures, referrals, and recommendations without direct exercise intervention.

**Main Outcome Measures:** Primary outcome was fall incidence within 1 year. Secondary outcomes were PPA battery (overall fall risk index, vision, muscular strength, reaction time, balance, and proprioception), Timed Up & Go (TUG) test, Taiwan version of the International Physical Activity Questionnaire, EuroQol-5D, Geriatric Depression Scale (GDS), and the Falls Efficacy Scale-International at 3 months after randomization.

**Results:** Participants were 76±7 years old and included low risk 25.6%, moderate risk 25.6%, and marked risk 48.7%. The cumulative 1-year fall incidence was 25.2% in the IG and 27.6% in the CG (hazard ratio=.90; 95% confidence interval, .66−1.23). The IG improved more favorably

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than the CG on overall PPA fall risk index, reaction time, postural sway with eyes open, TUG test, and GDS, especially for those with marked fall risk.

**Conclusions:** The multifactorial fall prevention program with exercise intervention improved functional performance at 3 months for community-dwelling older adults with risk of falls, but did not reduce falls at 1-year follow-up. Fall incidence might have been decreased simultaneously in both groups by heightened awareness engendered during assessments, education, referrals, and recommendations.

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Facing aging societies, fall prevention is an urgent public health concern, because falls occur in more than one third of people aged over 65 each year, leading to injury, decreased functioning, and mortality.[1-3] Interventions involving systematic fall risk assessment and targeted interventions, exercise programs, and environmental inspection along with hazard-reduction programs are recommended to reduce the incidence and adverse consequences from falls.[1-7] However, current evidence of fall prevention suggests that multifactorial fall risk assessment and intervention may reduce the fall risk or fall incidence rates only by a modest amount[2,5,8,9] or may even be noncontributing.[1,10-23] Whether the fall reducing effect becomes more obvious when targeting community-dwelling older adults at high risk of falls is not yet conclusive.[7-9,11-13,15-17,19-23]

Despite the large body of literature that exists in this field, reevaluations of those apparently effective strategies in different health care systems are still warranted. Studies regarding the effects of fall intervention programs on reducing falls or fall risk from Asian countries are relatively scarce with a limited sample size.[24-27] This multicenter randomized controlled trial was conducted to examine the effects of a multifactorial fall prevention program on fall incidence and physical function in community-dwelling older adults identified with a risk of falls in Taiwan. Furthermore, this study explored the differential intervention effects for older adults with different levels of fall risk.

## Methods

### Study design

The Fall Prevention Initiatives in Taiwan (FPIT) was a prospective, multicenter, randomized controlled trial to examine the effects of a multifactorial fall assessment and prevention program in reducing fall incidence and fall risks for community-dwelling older adults at a risk for falls. The FPIT was conducted from January 2008 to June 2010 in 3 leading cities in Taiwan: Taipei, Tainan, and Kaohsiung. Three medical centers, including National Taiwan University Hospital, National Cheng-Kung University Hospital, and Kaohsiung Chang-Gung Memorial Hospital, as well as their adjacent community health centers, participated in this study. This study was approved by the institutional review boards of the 3 participating medical centers. Informed consent was obtained for all subjects prior to enrollment in this study.

***List of abbreviations:***

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| **BI** | **Barthel Index** |
| **CG** | **control group** |
| **FPIT** | **Fall Prevention Initiatives in Taiwan** |
| **GDS** | **Geriatric Depression Scale** |
| **IG** | **intervention group** |
| **IPAQ** | **International Physical Activity Questionnaire** |
| **PPA** | **Physiological Profile Assessment** |
| **TUG** | **Timed Up & Go** |

### Participants and recruitment

Community-dwelling adults older than 65 years old were recruited from the outpatient department or emergency department of the study centers, or through regular activities at their adjacent community health centers. Geriatrics-related specialists in study centers were invited to refer their outpatients for fall risk screening offered by this study. A brief fall screening algorithm was administered to target older adults with a risk of falls.[28,29] Subjects were enrolled if 1 of the following inclusion criteria was fulfilled: (1) encountered recurrent falls during the previous year; (2) had medical history known to carry high risk of falls (ie, stroke, Parkinson's disease, head injury, or fractures because of falls); and (3) fell only once during the previous year, coupled with gait or balance problems ascertained by the Timed Up & Go (TUG) test.[30] Subjects were excluded if they were unable to provide study information and comply with study procedures, or if they had any medical condition precluding regular exercise participation, as advised by their primary physicians. Subjects were counseled to seek medical advice if they had physical limitations or ever experienced chest pain, numbness, palpitations, dizziness, or lightheadedness during exercise or physical activity.[31]

### Baseline assessment

The baseline assessment included: (1) a structured questionnaire, (2) a series of physical performance tests, (3) a short quiz on falls-related knowledge, and (4) a home environmental hazards assessment. Several trained research personnel from each study center completed baseline assessments using standardized procedures.

The subjects' background information was recorded, including demographics (age, sex, education, living arrangement), comorbid medical conditions (eg, hypertension, diabetes mellitus, cardiovascular disease, gastrointestinal disorder, psychiatric illness), prescribed medications, including psychotropic medications (antipsychotics, antidepressants, and sedative hypnotics), use of walking aids, prior history of falls, and falls-related injuries. A set of health-related instruments were administered, including the EuroQol-5D,[32] Geriatric Depression Scale (GDS) Short Form (0−15, score $\geq$5 was considered as having depressive symptoms),[33] Fall Efficacy Scale-International (1−5, from not fearful to extremely fearful),[34] Barthel Index (BI) (0−100, score $\geq$95 was considered functional independence),[35] Taiwan version of the International Physical Activity Questionnaire (IPAQ),[36] and the Mini-Mental State Examination (0−30, score $\leq$23 was considered as cognitively impaired with age and education level adjusted).[37]