



Meeting 4

# Aging

**Chair: Loretta DiPietro**

Members: David Buchner, Wayne Campbell, Kirk Erickson, Abby King, Ken Powell

# Experts and Consultants



- Invited experts: None.
- Consultants: None.

# Subcommittee Questions



- What is the relationship between physical activity and risk of injury due to a fall?
- What is the relationship between physical activity and physical function?

# Question 1

1. What is the relationship between physical activity and risk of injury due to a fall?
  - a) Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - b) Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
  - c) What type(s) of physical activity are effective for preventing injuries due to a fall?
  - d) What factors (e.g. cognitive impairment or specific disease states) modify the relationship between physical activity and risk of injury due to a fall?
  
- Source of evidence to answer question:
  - Combination of SR/MA/Existing report and *de novo* systematic review of original articles

# Analytical Framework

## Systematic Review Question

What is the relationship between physical activity and the risk of injuries from falling?

## Target Population

Adults, 50 years and older (Lower age range for included data must be a minimum of 50 years)

## Comparison

Adults, 50 years and older, who participate in varying levels of physical activity, including no reported physical activity

## Intervention/Exposure

All types and intensities of physical activity

## Intermediate Outcomes

- Balance
- BMI
- Bone health
- Disease diagnosis
- Falls
- Functional limitations
- Mobility
- Strength

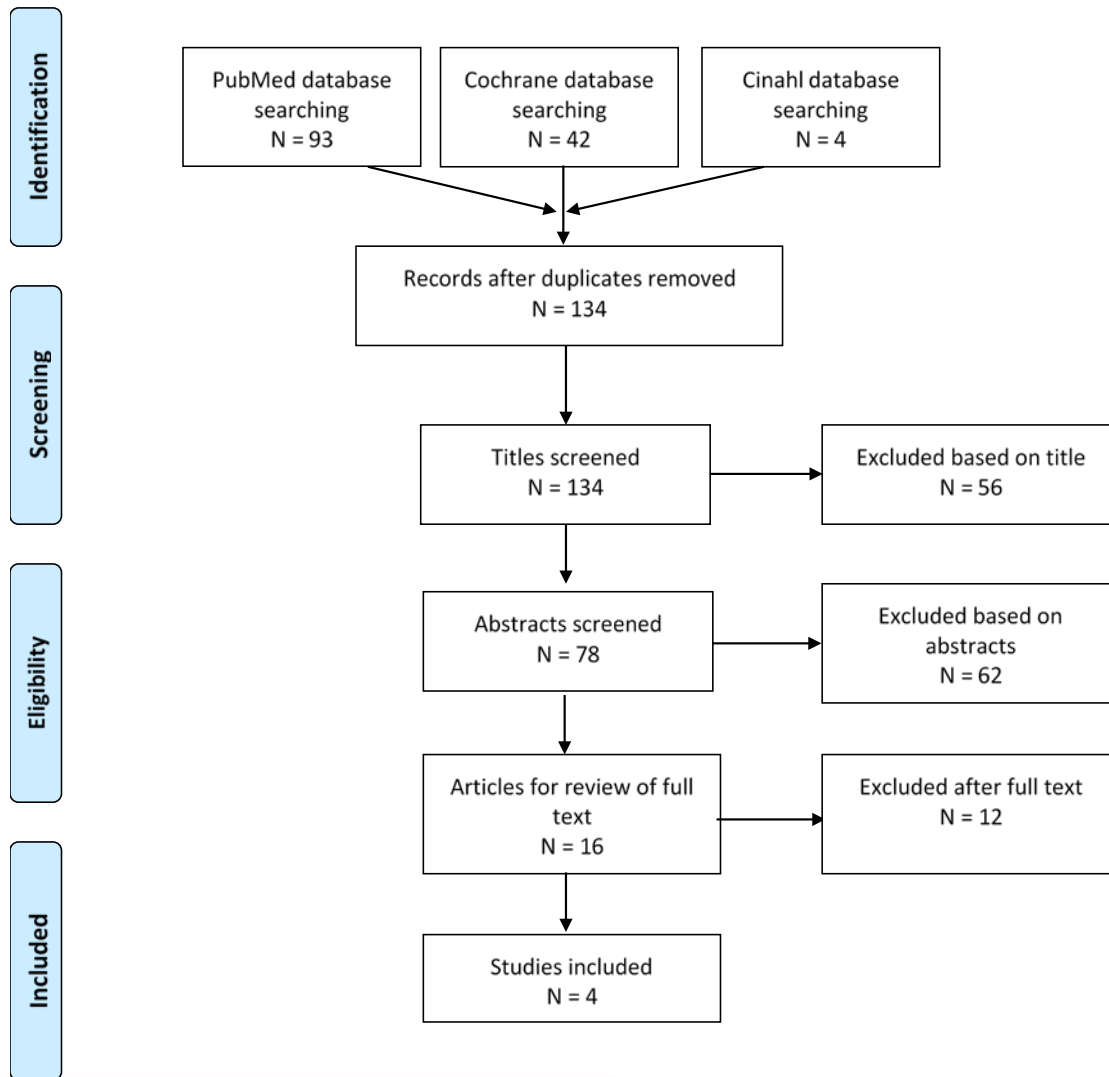
## Endpoint Health Outcomes

- All/Any injuries from falls
- Fractures
- Head injuries
- Intraabdominal injury
- Limitation of daily activities
- Medically attended injury
- Neck, back, and spine injuries
- "Pooled" injuries
- Reduction in routine activities
- Sprains

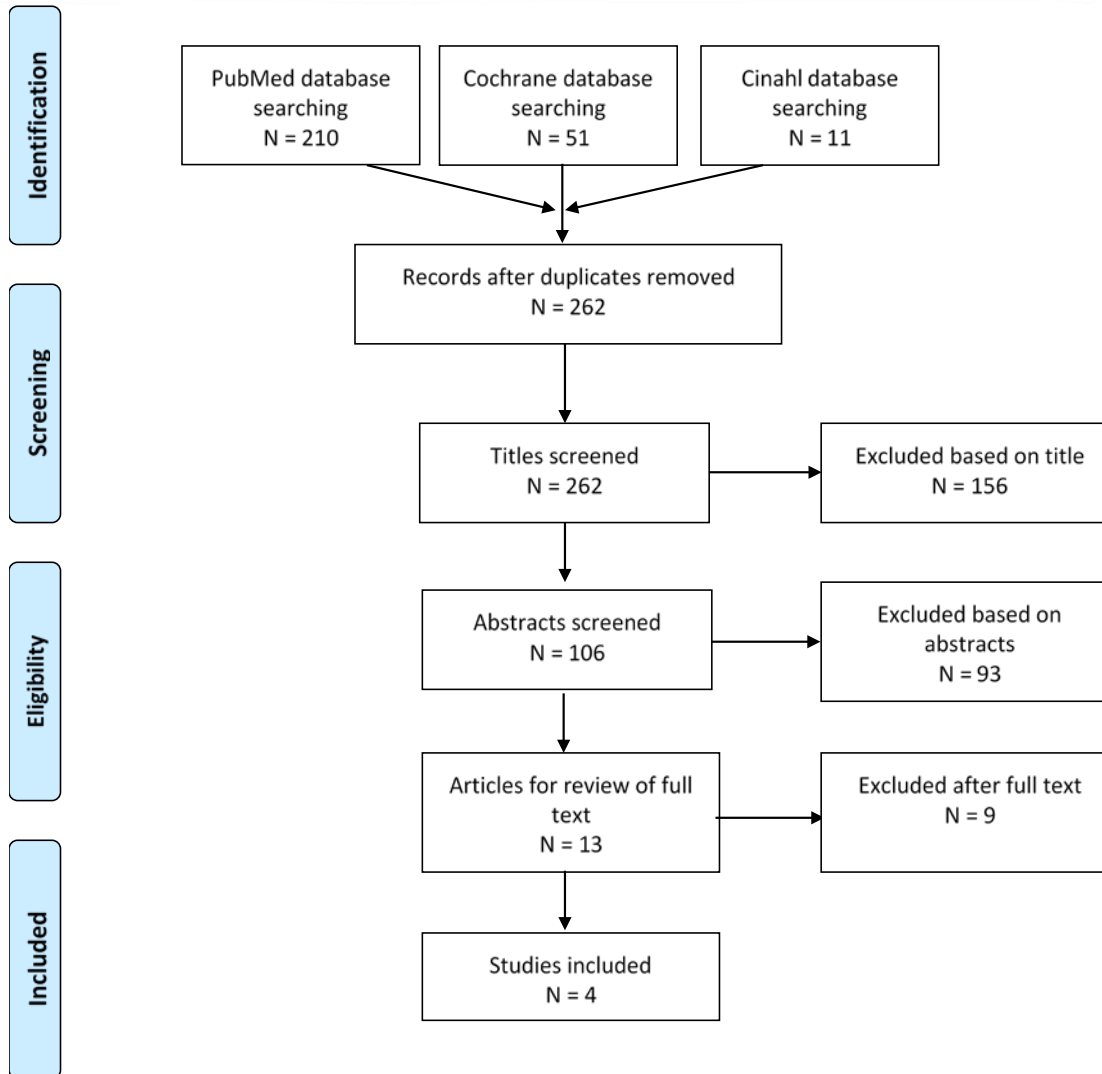
## Key Definitions:

- Fall: The act of moving without control from being upright to not being upright
- Injury from a fall: An injury resulting from a fall
- Risk of injury from a fall: The statistical odds of experiencing an injury from a fall

# Search Results: High-Quality Reviews<sup>1</sup>



# Search Results: Original Research



# Draft Key Findings



## Overall Findings

- Based on the findings from RCTs, higher levels of physical activity reduce the risk of injurious falls among older adults in community and home settings
- The reduction in risk is approximately 32-66% for all injurious falls and 40-66% for fall with fractures



# Draft Conclusions

Strong evidence demonstrates that participation in multicomponent group or home-based fall prevention physical activity and exercise programs can significantly reduce the risk of injury from falls, including severe falls that result in bone fracture, head trauma, open wound soft tissue injury, or any other injury requiring medical care or admission to hospital among community dwelling older adults. **PAGAC Grade: Strong**

# Draft Key Findings



## **Dose-response**

- Mostly consistent results from three high-quality prospective cohort studies suggest that moderate-intensity physical activity reduces the risk of fall-related injury and bone fracture.
- Lower amounts of moderate-intensity physical activity and low-intensity walking may be insufficient to affect the risk of fall-related injury and bone fracture.

# Draft Key Findings



## **Race/ethnicity/SES**

- Information on the race/ethnicity and socio-economic status of participants was limited, inconsistently presented, and not statistically assessed.

## **Weight Status**

- Weight status did not significantly influence the relationship between physical activity and bone fracture risk among cohorts of women ages 70 to 75 years [Heesch et al., 2008] or men ages 65 years and older [Cauley et al., 2013].

# Draft Key Findings



## Age

- Age (<80 vs  $\geq$  80 years) did not influence the relationship between higher levels of active energy expenditure or moderate-intensity activity and lower risk of fracture in a cohort of men ages 65 years and older [Cauley et al. 2013].

## Gender

- Although the majority of participants in the reviewed studies were female, the benefit of physical activity to reduce the risk of injurious falls was observed in cohorts of men [Cauley et al., 2013] and women [Heesch et al., 2008].

# Draft Key Findings

## Types of physical activity

- Fall prevention exercise programs that effectively reduced the risk of injurious falls and bone fractures contained a variety of community-based group and home activities [El-Khoury, 2013; Zhao, 2016; OntMedAdv Sec, 2008; Linattiniemi, 2008; Peel, 2006].
- Most exercise training programs were multi-component, including various combinations of moderate-intensity training for balance, strength, endurance, gait, and physical function, along with recreational activities (e.g., dancing, cycling, gardening, sports).

# Draft Conclusions

Limited evidence suggests that a dose-response relationship exists between the amount of moderate to high-intensity physical activity or home and group exercise and risk of fall-related injury and bone fracture. However, the small number of studies available and the diverse array of physical activities studied make it difficult to describe the shape of the relationship. **PAGAC Grade: Limited**

# Draft Conclusions

- Insufficient evidence is available to determine whether the relationship between physical activity and risk of injury and bone fracture due to a fall varies by age, sex, race/ethnicity, socio-economic status, or weight status. **PAGAC Grade: Grade not assignable**
- Moderate evidence indicates that the risk of fall-related injury and bone fracture may be reduced using a variety of community-based group and home physical activities. Effective multi-component physical activity regimens generally include combinations of balance, strength, endurance, gait, and physical function training, and recreational activities. **PAGAC Grade: Moderate**
- Insufficient evidence is available to determine whether any factors modify the relationship between physical activity and risk of injury due to a fall. **PAGAC Grade: Grade not assignable**

# Draft Research Recommendations

- Conduct large-scale randomized clinical trials of older adults at high risk of falls that are designed with fall-related injuries and bone fractures as the primary outcomes of interest.
- Investigate further dose-response relationships between physical activity and fall-related injuries and bone fractures.
- Investigate further the potential modifying effects of age, sex, race/ethnicity, socioeconomic status, weight status, and other identified potential effect modifiers on the relationship between physical activity and injurious falls and bone fractures.



# Committee Discussion

1. What is the relationship between physical activity and risk of injury due to a fall?
  - a) Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - b) Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
  - c) What type(s) of physical activity are effective for preventing injuries due to a fall?
  - d) What factors (e.g., cognitive impairment or specific disease states) modify the relationship between physical activity and risk of injury due to a fall?

# Question 2

2. What is the relationship between physical activity and physical function?
  - a) Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - b) Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
  - c) What type(s) of physical activity are effective for improving or maintaining physical function?
  - d) Does the relationship vary by level of physical and/or cognitive impairment and by selected chronic conditions (e.g., Alzheimer's, Parkinson's, osteoporosis, coronary heart disease, after hip fracture)?
  
- Source of evidence to answer question: TBD

# Analytical Framework

## Systematic Review Question

What is the relationship between physical activity and physical function?

## Target Population

Adults, 50 years and older (Lower age range for included data must be a minimum of 50 years)

## Comparison

Adults, 50 years and older, who participate in varying levels of physical activity, including no reported physical activity

## Intervention/Exposure

All types and intensities of physical activity

## Endpoint Health Outcomes

- Physical function
- Functional ability
- Move around
- Behavioral ability
- Behavioral disability
- Functional limitations
- Loss of physical function
- Physical disability
- Physical intrinsic capacity

## Key Definitions:

- “Physical function” and “physical functioning” are regarded as synonyms that refer to: “the *ability* of a person to move around and to perform types of physical activity.”
- For example, measures of physical function include measures of ability to walk (e.g., usually gait speed), run, climb stairs, carry groceries, sweep the floor, stand up, and bath oneself.
- As measures of behavioral abilities, physical function measures do not include:
  - Physiologic measures, including measures of physiologic capacity (e.g., maximal lung capacities, maximal aerobic capacity, maximal muscle strength, bone density).
  - Measures of the environment or of the host-environmental interaction (e.g., disability accommodation).
  - Measures of what a person usually does (e.g., physical activity level) (as opposed to what a person is capable of doing).

# Physical Activity Types and Populations Being Addressed



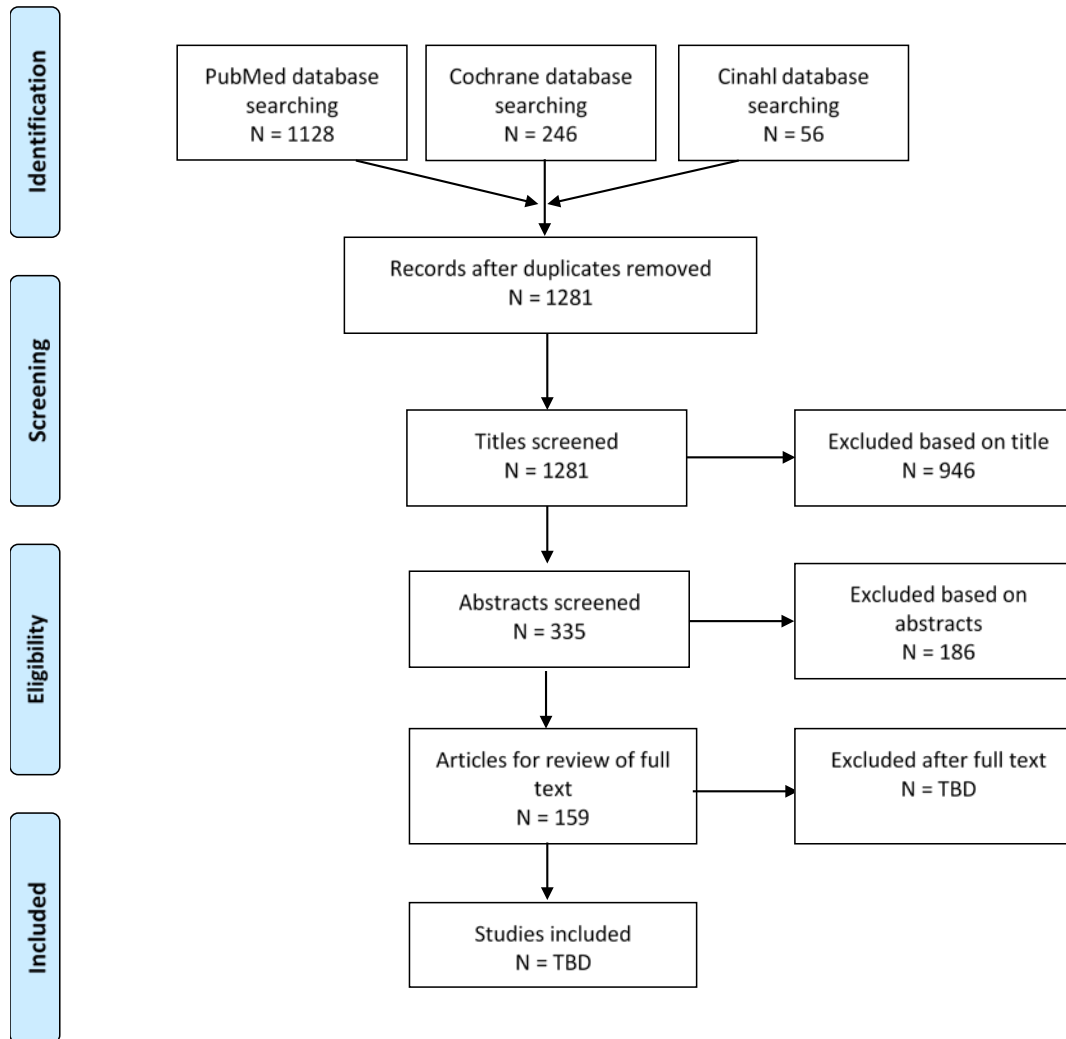
## Physical Activity Types

- Single component (e.g., strength training, yoga)
- Dual-task (e.g., walking while counting backwards)
- Multiple component (e.g., strength plus balance training)

## Populations

- General Aging
- Level of Impairment
  - Healthy aging
  - Visual Impairment
  - Cognitive Impairment
  - Physical Impairment
  - Frailty
- Specific Disease State
  - Alzheimer's Disease
  - Chronic Obstructive Pulmonary Disease
  - Congestive Heart Failure
  - Coronary Artery/Heart Disease
  - Obesity
  - Osteoporosis/Osteopenia
  - Parkinson's Disease
  - Post-Hip Fracture

# Search Results: High-Quality Reviews<sup>1</sup>



# Committee Discussion

2. What is the relationship between physical activity and physical function?
  - a) Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - b) Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
  - c) What type(s) of physical activity are effective for improving or maintaining physical function?
  - d) Does the relationship vary by level of physical and/or cognitive impairment and by selected chronic conditions (e.g., Alzheimer's, Parkinson's, osteoporosis, coronary heart disease, after hip fracture)?