Meeting 5

Exposure

Chair: Bill Kraus

Members: Wayne Campbell, John Jakicic, Kathy Janz, Ken Powell

Experts and Consultants

- Consultant:
  - William L. Haskell, Ph.D., FACSM

    Stanford University

Subcommittee Questions

1. What is the relationship between physical activity and all-cause mortality?
2. What is the relationship between physical activity and cardiovascular disease mortality?
3. What is the relationship between physical activity and cardiovascular disease incidence?

Question 1

1. What is the relationship between physical activity and all-cause mortality?
   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, or socio-economic status?

- Source of evidence to answer question:
  – Systematic Reviews, Meta-Analyses, Pooled Analyses

Draft Conclusion Statement

- **Conclusion Statements:**
  - Strong evidence demonstrates a significant relationship between greater amounts of physical activity and decreased incidence of all-cause mortality.
  - PAGAC Grade: Strong
  - The strength of the evidence is unlikely to be modified by more studies for these outcomes.

Draft Conclusion Subquestions

- Strong evidence demonstrates a significant dose-response relationship between physical activity and all-cause mortality.
  - PAGAC Grade: Strong
- All evidence based upon energy expenditure (MET-h/w or kcal per week).
- Shape of the curve is nonlinear with the greatest benefit seen early in the dose-response relation.
- There is no lower limit for the relation of MPVA and risk reduction. Risk appears to continue to decrease with increased exposure up to at least 5 times the current recommended levels of MVPA.

Draft Conclusion Statements – Sub-questions

- Strong evidence demonstrates that these relationships do not vary by age, gender, race, and BMI.
- PAGAC Grade: Strong
- Insufficient evidence is available to determine whether these relationships vary by ethnicity and SES.
- PAGAC Grade: Grade not assignable

Question 2

2. What is the relationship between physical activity and cardiovascular disease mortality?
   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, or socio-economic status?

- Source of evidence to answer question:
  – Systematic Reviews, Meta-Analyses, Pooled Analyses

Draft Conclusion Statement

- **Conclusion Statements:**
  - Strong evidence demonstrates a significant relationship between greater amounts of physical activity and cardiovascular disease mortality.
  - PAGAC Grade: Strong
  - The strength of the evidence is very unlikely to be modified by more studies for these outcomes.

Draft Conclusion Statements – Sub-questions

- Strong evidence demonstrates a significant dose-response relationship between physical activity and cardiovascular disease mortality.
- PAGAC Grade: Strong

- Evidence based upon energy expenditure (MET-h/w or kcal per week).
- Shape of the curve is nonlinear with the greatest benefit seen early in the dose-response relation.
- There is no lower limit for the relation of MPVA and risk reduction. Risk appears to continue to decrease with increased exposure up to at least 5 times the current recommended levels of MVPA.

Draft Conclusion Statements – Sub-questions

- Strong evidence demonstrates that these relationships do not vary by age, gender, race, and BMI.
- PAGAC Grade: Strong
- Insufficient evidence is available to determine whether these relationships vary by ethnicity and SES.
- PAGAC Grade: Grade not assignable

Question # 3

- What is the relationship between physical activity and cardiovascular disease incidence?
  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, or socio-economic status?
- Source of evidence to answer question:
  – Systematic reviews
  – Meta-analyses

Analytical Framework

Systematic Review Questions

What is the relationship between physical activity and cardiovascular disease incidence?

Population

Adults, 18 years and older

Exposure

All types and intensities of physical activity, including lifestyle activities/leisure activities

Comparison

Adults who participate in varying levels of physical activity

Endpoint Health Outcomes

•Cardiovascular disease incidence

Key Definitions

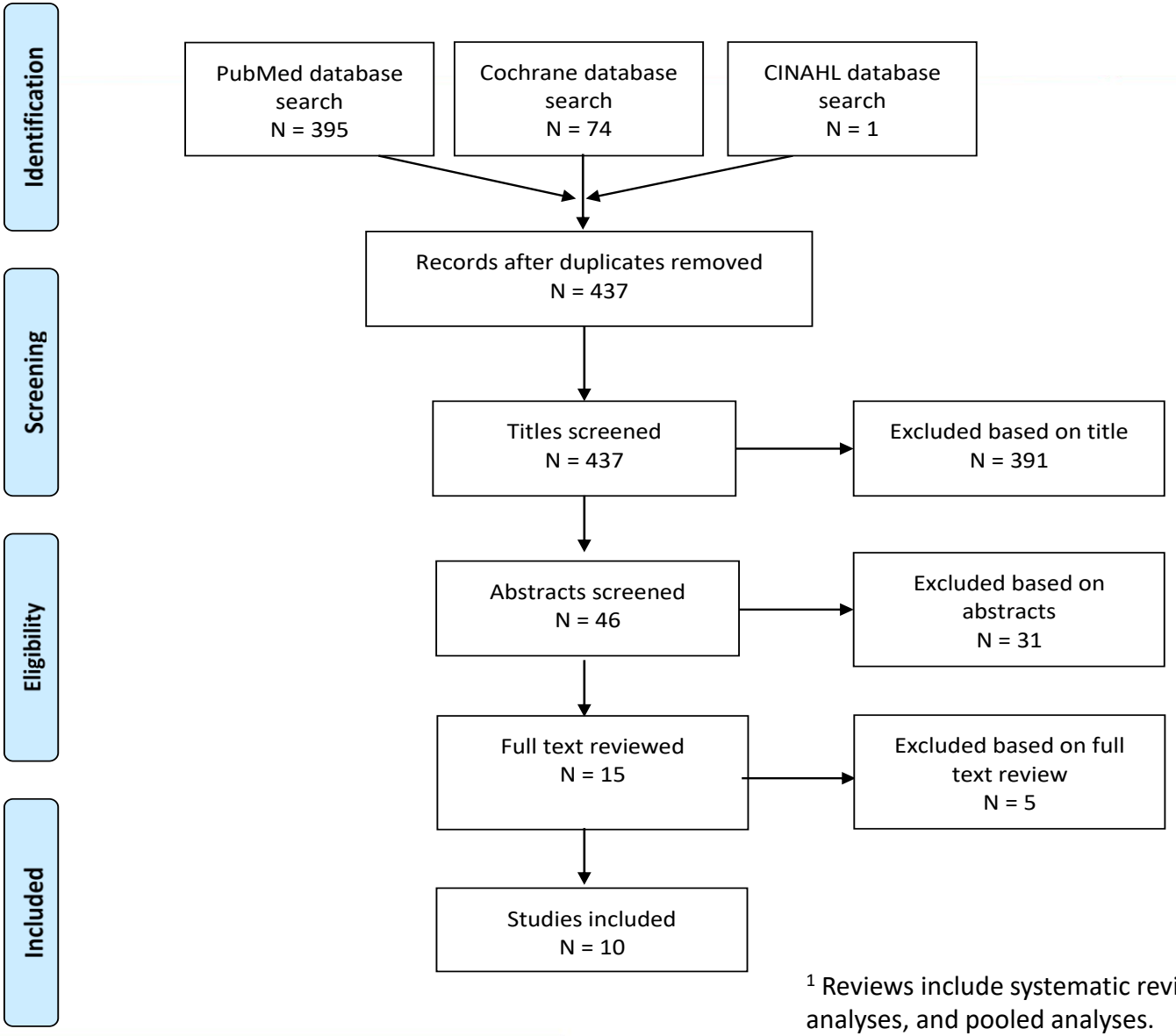
Scope of CVD:

- Coronary heart disease/ischemic heart disease.
- Coronary artery disease
- Stroke
- Heart failure

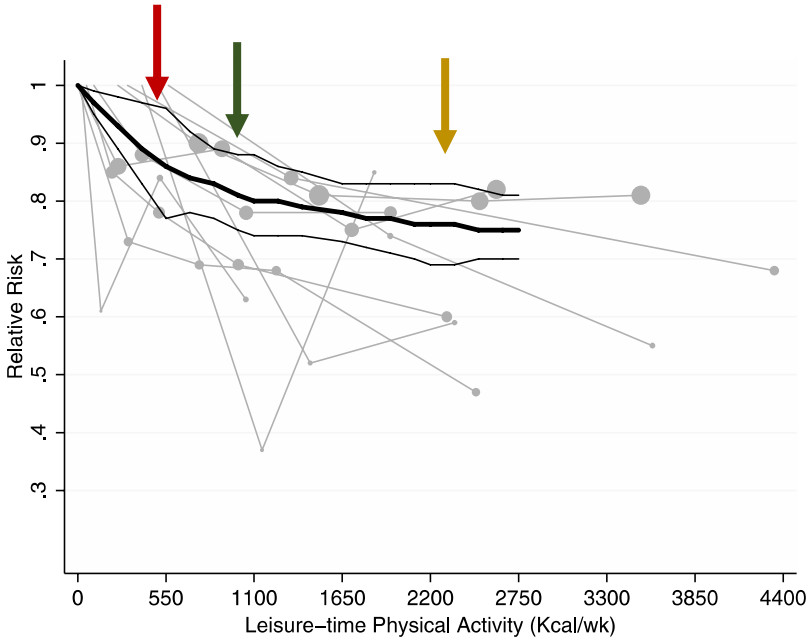
Exclusion:

- Congenital heart disease

Search Results: High-Quality Reviews[1]



[1] Reviews include systematic reviews, meta-analyses, and pooled analyses.

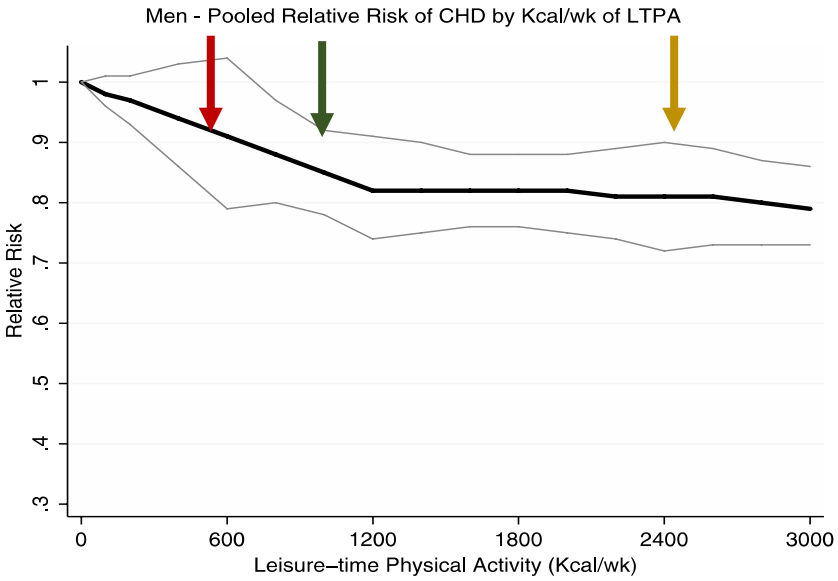


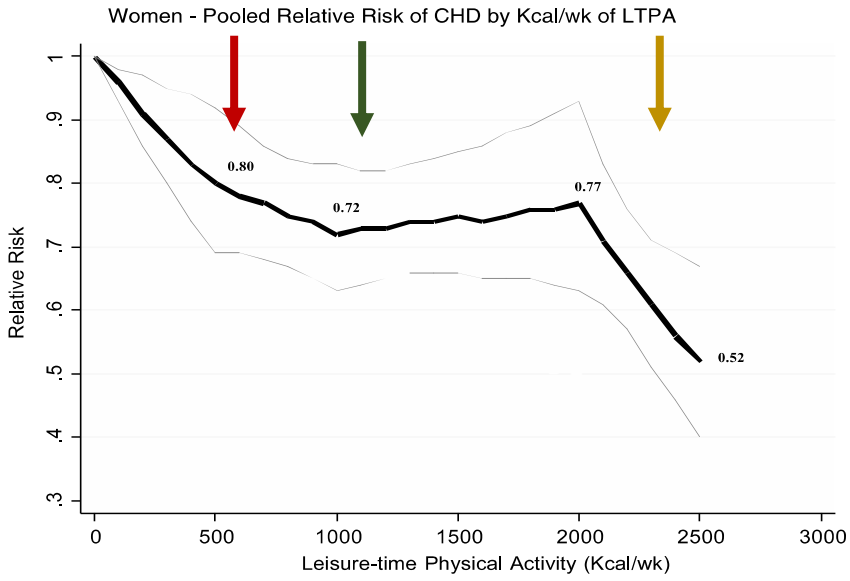
Sattelmair J, Pertman J, Ding EL, Kohl HW 3rd, Haskell WL, Lee IM (2011). Dose response between physical activity and risk of coronary heart disease: a meta-analysis Circulation, 124(7), 789-95

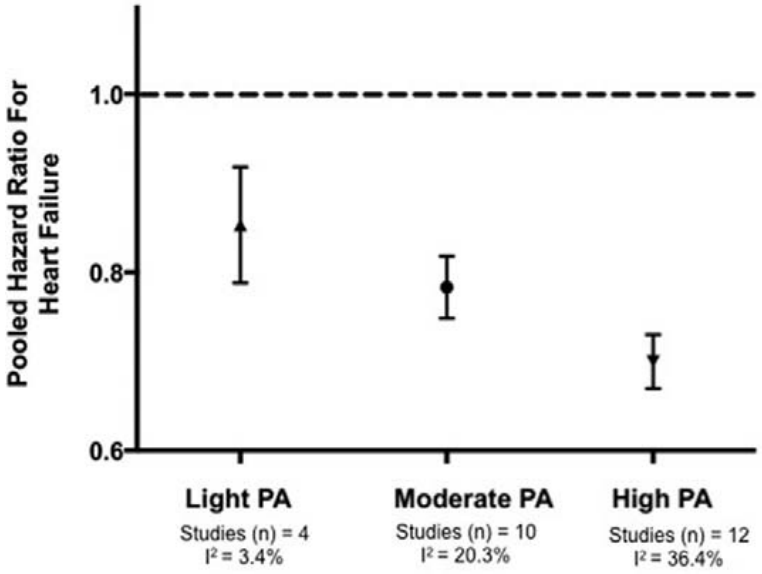
8.5 MET-h/w

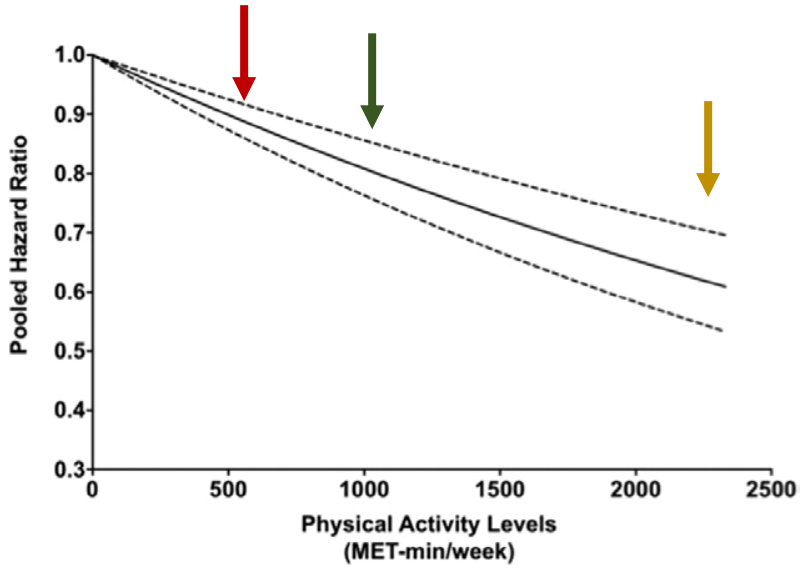
17 MET-h/w

35 MET-h/w







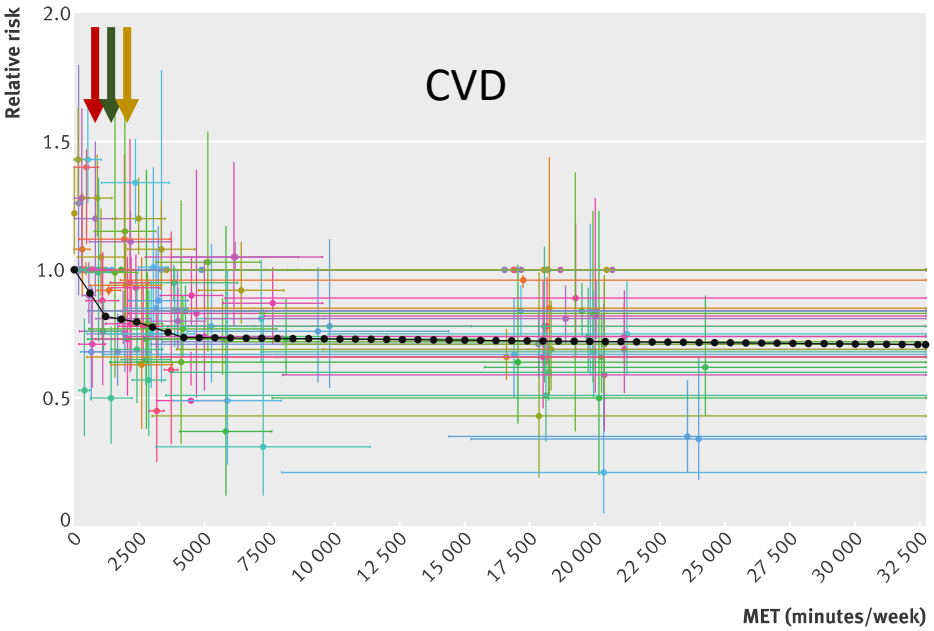


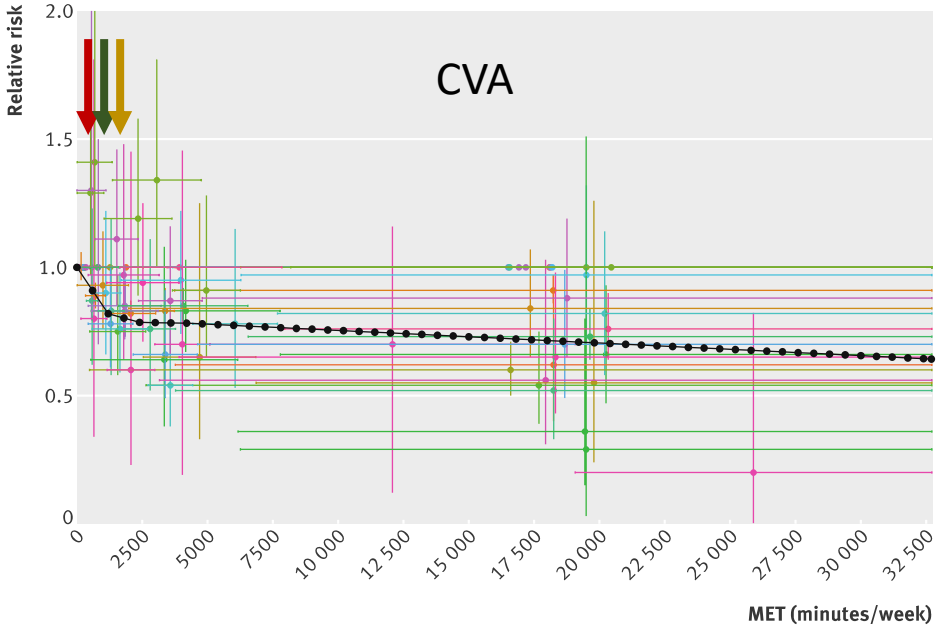
Pandey A,Garg S, Khunger M, Darden D, Ayers C ,Kumbhani DJ, Mayo HG, de Lemos JA, Berry JD (2015). Dose-Response Relationship Between Physical Activity and Risk of Heart Failure: A Meta-Analysis Circulation, 132(19), 1786-94

8.5 MET-h/w

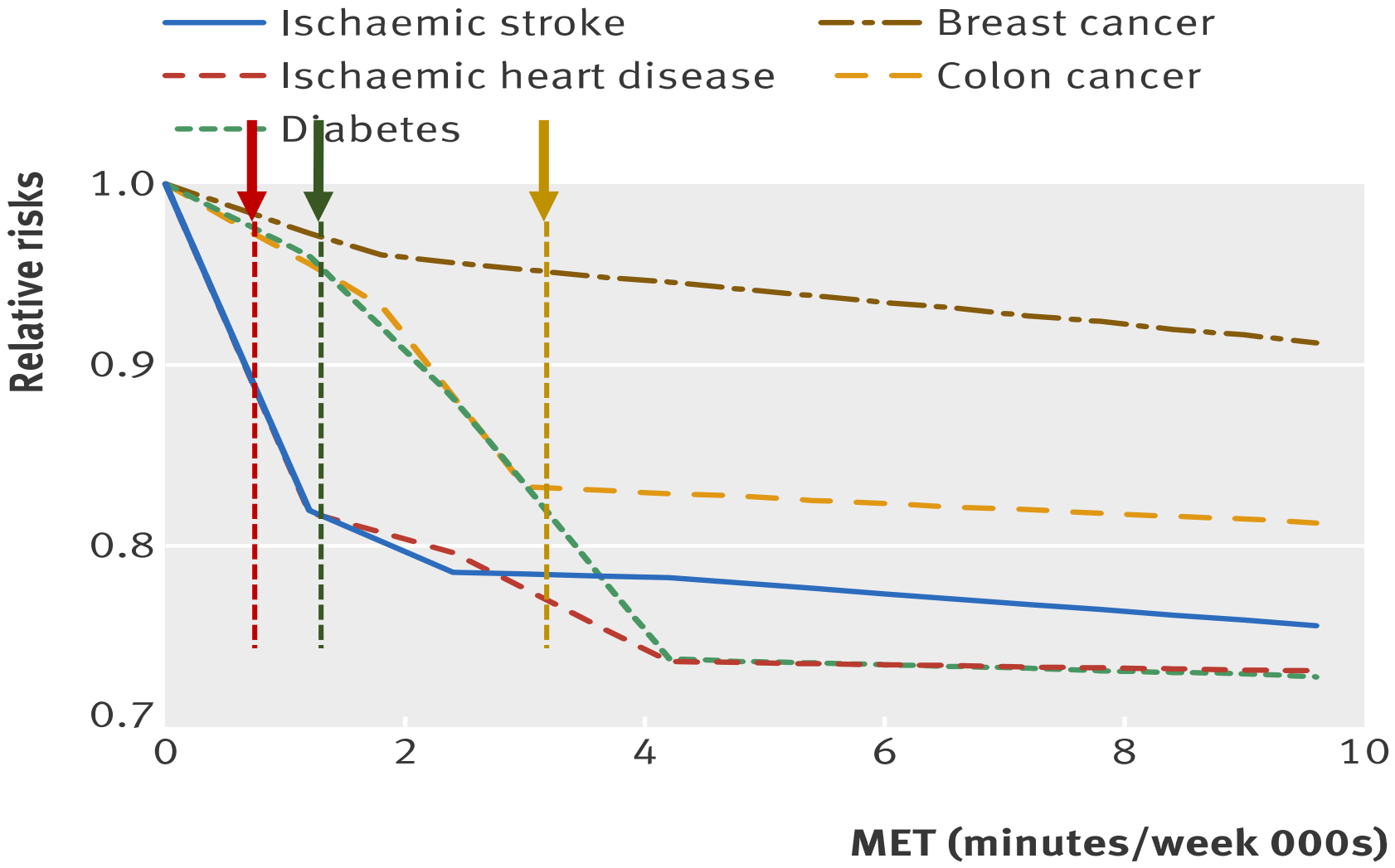
17 MET-h/w

35 MET-h/w





Kyu HH, Bachman VF, Alexander, et al. (2016). Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013 BMJ, 354.



Kyu HH,Bachman VF, Alexander L *et al.* Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013 BMJ, 354.

Draft Conclusion Statement

- **Conclusion Statements:**
  - Strong evidence demonstrates a significant relationship between greater amounts of physical activity and decreased incidence of CVD, stroke and heart failure.
  - PAGAC Grade: Strong
  - The strength of the evidence is unlikely to be modified by more studies for these outcomes.

Draft Conclusion Statements – Sub-questions

- Strong evidence demonstrates a significant dose-response relationship between physical activity and incidence of CVD, HF and stroke.
- PAGAC Grade: Strong

- All evidence based upon energy expenditure (MET-h/w or kcal per week).

Draft Conclusion Statements – Sub-questions

- Insufficient evidence is available to determine whether these relationships vary by age, gender, race, ethnicity, SES, BMI.
- PAGAC Grade: Grade not assignable
  - Although there are some data to point to the existence of an "obesity paradox" for individuals with HF, no one has investigated whether this translates to the effects of physical activity on HF outcomes.

Draft Research Recommendations

- Conduct more longitudinal studies of the relation of physical activity on CAD, HF and stroke to study
  - the effect modifications by age, race, sex, body mass, and SES
  - using objective measures of physical activity

Committee Discussion

- What is the relationship between physical activity and cardiovascular disease incidence?
  - CAD
  - HF
  - Stroke (CVA)

Subcommittee Questions

4. What is the relationship between step count per day and (1) mortality (i.e., all-cause or cause-specific) and (2) disease incidence (e.g., coronary heart disease, type 2 diabetes)?
5. What is the relationship between bout duration of aerobic physical activity and health outcomes?
6. What is the relationship between high intensity interval training and reduction in cardiometabolic risk?

Subcommittee Sub-questions

Sub-questions for Q1-4, Q5*, and Q6

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?

*Note: Dose-response not examined for Q5

Question # 4 Steps

- What is the relationship between step count per day and (1) mortality (i.e., all-cause or cause-specific) and (2) disease incidence (e.g., coronary heart disease, type 2 diabetes)?
- Source of evidence to answer question:
  - De novo systematic review of original articles

Analytical Framework

Systematic Review Questions

Q4. What is the relationship between step count per day and (1) mortality (i.e., all-cause and CVD) and (2) disease incidence (e.g., CVD, type 2 diabetes)?

Population

Adults, 18 years and older

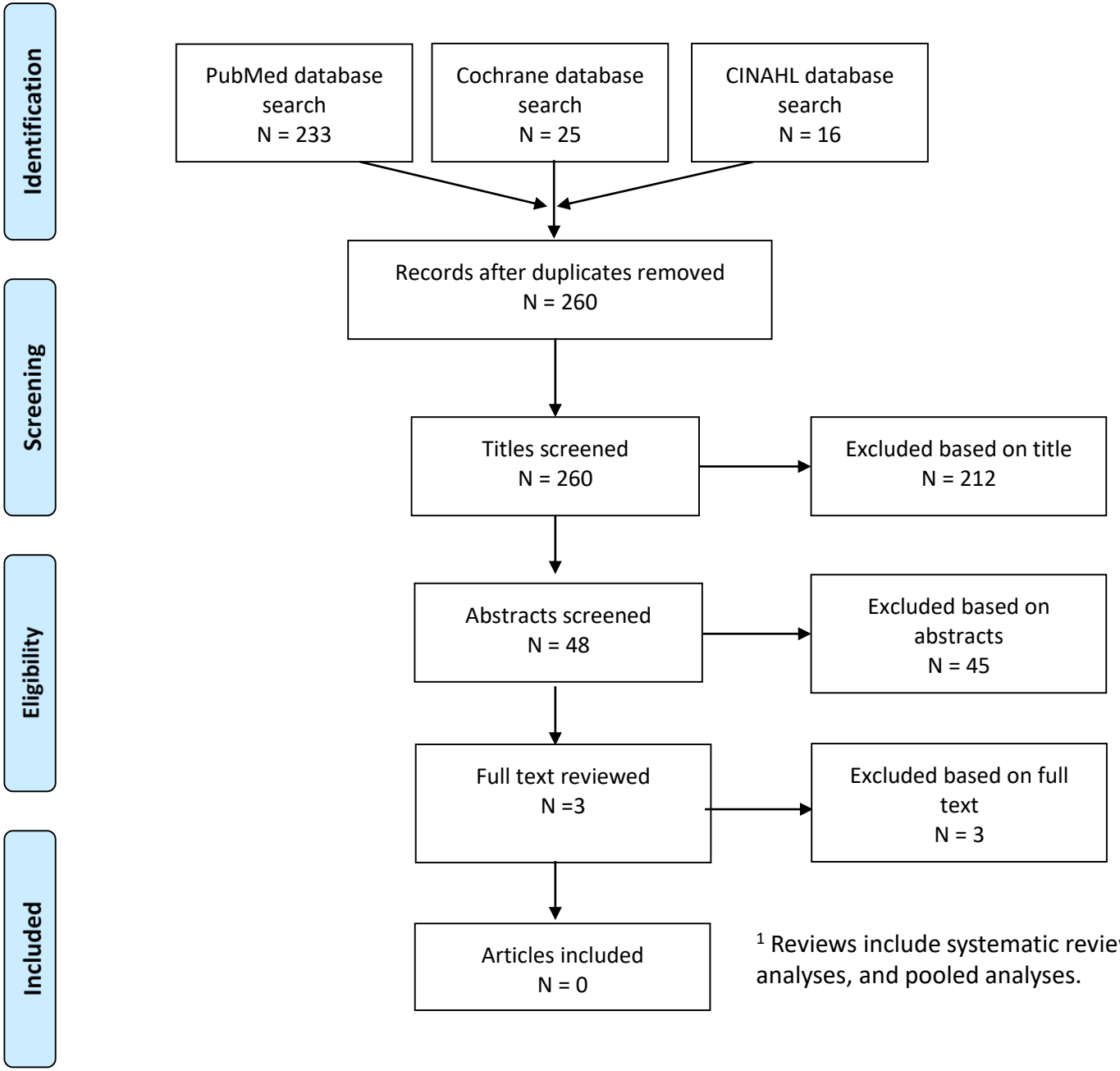
Exposure

- PA in **step counts** per day

Endpoint Health Outcomes

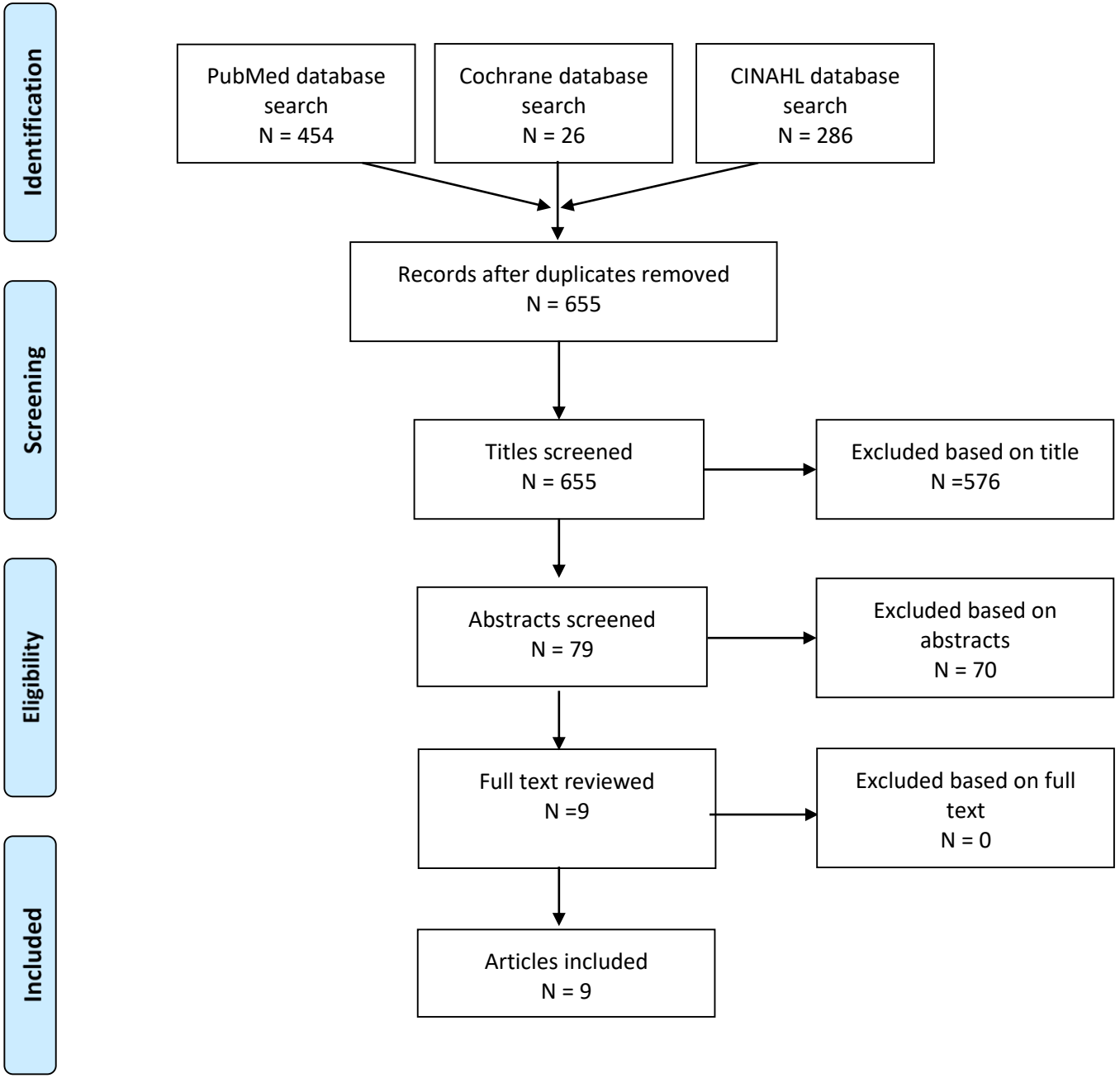
- All-cause and CVD mortality
- CVD incidence
- Incidence of Type 2 Diabetes

Search Results Q4 STEPS: High-Quality Reviews[1]



[1] Reviews include systematic reviews, meta-analyses, and pooled analyses.

Search Results Q4 STEPS: Original Research



Description of the Evidence

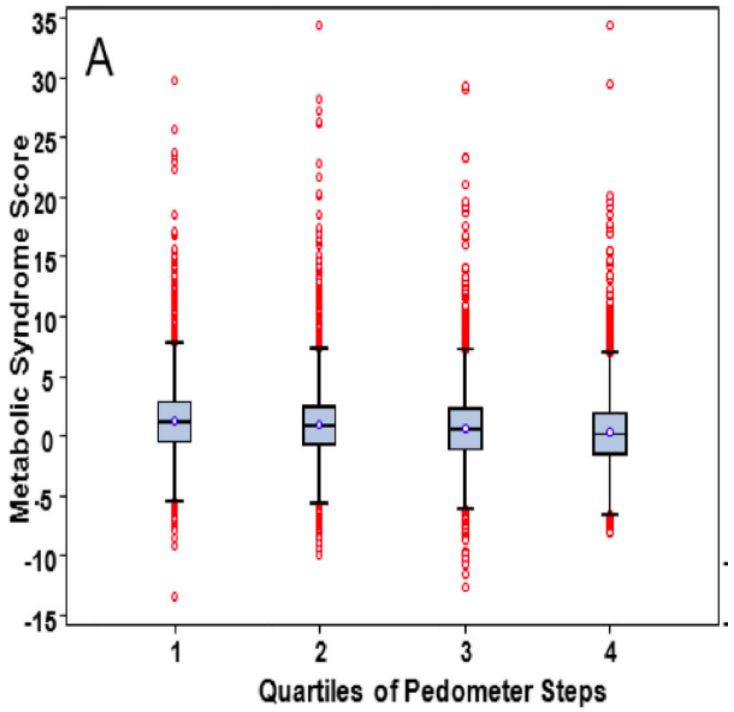
- Included articles (n=9)
  - 4 cross sectional studies
  - 4 prospective longitudinal
  - 1 randomized trial
- Studies examined sub-group effects:
  - Gender, Age Groups, Ethnicity, Nationality, Weight Status
- Exposure
  - Pedometer-measured steps.
- Dose-response
  - Addressed via regression

Draft Key Findings

- The Navigator study, a multicenter trial of 9,306 individuals with impaired glucose recruited from 40 countries, provided 4 manuscripts (3 longitudinal and 1 cross-sectional).

Draft Key Findings

Huffman (2014) analyzed Navigator data and showed for every 2,000 increment increase in baseline steps per day there was an expected 0.29% reduction in the 6-year metabolic syndrome score. The relationship was independent of age, sex, geographic region, and baseline level of steps per day. The dose-response relationship appeared linear.



Huffman 2014

Baseline characteristics by pedometer quartile.

Characteristic	Total Population (N=7118)	Quartile 1 (N=1779)	Quartile 2 (N=1780)	Quartile 3 (N=1780)	Quartile 4 (N=1779)	P Value
Average daily pedometer steps: month 0.5						
Median (25th, 75th)	5669.1 (3456.4, 8568.9)	1960.3 (623.6, 2781.6)	4560.2 (4003.7, 5095.7)	6987.8 (6255.6, 7719.4)	10,685.1 (9494.4, 12,505.7)	<0.0001
Mean (SD)	6178.4 (3832.5)	1752.8 (1167.8)	4554.1 (640.8)	7013.3 (833.5)	11393.9 (2483.8)	<0.0001

Draft Key Findings

Yates (2014) used Navigator data to show change in steps per day was associated with reduce risk for cardiovascular events, specifically, a yearly 2,000 steps per day increase resulted in an 8% yearly reduction in cardiovascular event rate. The dose-response appeared linear.

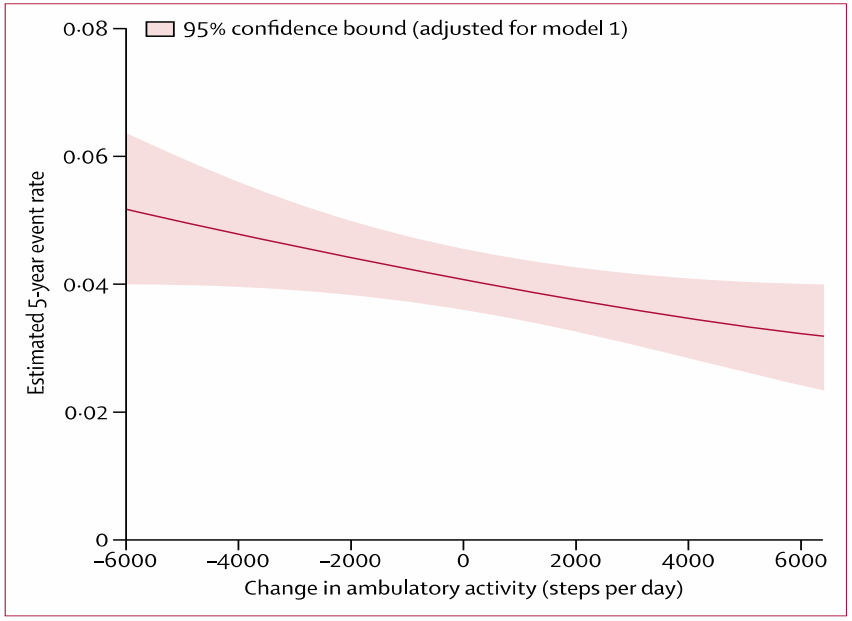
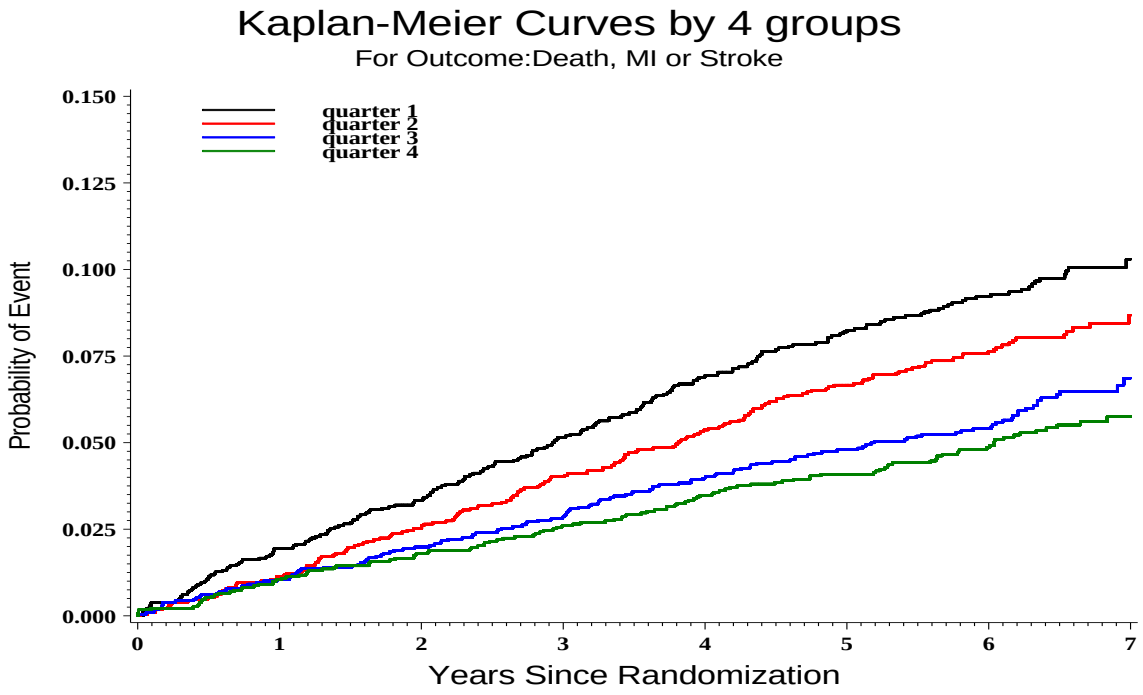


***Figure*: Relation between change in ambulatory activity and adjusted 5-year cardiovascular event rates**

Yates 2014

Draft Key Findings

Yates (2014) used Navigator data to show baseline level of steps per day was inversely associated with cardiovascular event incidence, specifically at baseline each 2000 steps per day increment was associated with a 10% lower cardiovascular event rate.



Yates 2014

Draft Conclusion Statements

- **Conclusion Statements:**
  - Insufficient evidence is available to determine the relationship between step counts per day and mortality (i.e., all-cause and CVD). No studies were identified that addressed this relationship
  - Moderate evidence indicates that step count per day is associated with incidence of cardiovascular disease and risk of type 2 diabetes
- Grade:
  - *Grade Not Assignable* for mortality.
  - *Moderate* for cardiovascular disease and risk of type 2 diabetes

Draft Conclusion Statement

- **Dose-response**

Moderate evidence indicates that there is a dose-response relationship between the measure of step per day and cardiovascular disease events and diabetes risk.

Grade: Moderate

- **Age, gender, race/ethnicity, socioeconomic status, weight status**

Insufficient evidence is available to determine whether the relationship between the measure of steps per day and cardiovascular disease events and diabetes risk is influenced by age, sex, race/ethnicity, socio-economic status, or weight status.

Grade: Grade Not Assignable

Draft Implications

The measure of steps per day has the potential to significantly improve the translation of research findings into public health recommendations, policies, and programs.

Draft Implications

- Steps are a basic unit of locomotion
  - Easy to understand metric of ambulation
- Measuring step counts shown to motivate diverse samples of individuals to increase physical activity levels
- Self-assessment of steps thorough objective, readily obtainable technology
- Step counts *per day* provides a comparable denominator to caloric intake *per day*
  - Tool for researchers and the public addressing a variety of health and physical activity issues
- Steps can be at light-, moderate-, and vigorous-intensity levels
  - Range of exertion choice for the promotion of walking

Draft Research Recommendations

- Conduct additional longitudinal research, either in the form of prospective studies or randomized trials, to examine the dose-response relationship between steps per day and health outcomes.
  - **Rationale:** In this review, only one randomized control trial was identified and it did not include multiple arms to examine the effects of various doses of steps per day on outcomes.

- Include measurement methods in prospective and randomized studies that will examine if the rate of stepping and the length (bouts) of continuous steps influence the relationship between steps per day and disease outcomes.
  - **Rationale:** The studies reviewed used simple pedometers that provided accumulated steps and could not address patterns nor intensity of steps per day.

Committee Discussion

- What is the relationship between step count per day and (1) mortality (i.e., all-cause or cause-specific) and (2) disease incidence (e.g., coronary heart disease, type 2 diabetes)?

Question # 5 Bouts

5. **What is the relationship between bout duration of aerobic physical activity and health outcomes?**

- Source of evidence to answer question:
  - De novo systematic review of original articles

Analytical Framework

Systematic Review Questions

Q5. What is the relationship between bout duration of aerobic physical activity health outcomes?

Population

Adults, 18 years and older

Exposure

- Physical activity (PA) performed in short bouts
- PA exposure of at least 12 weeks (intervention studies).

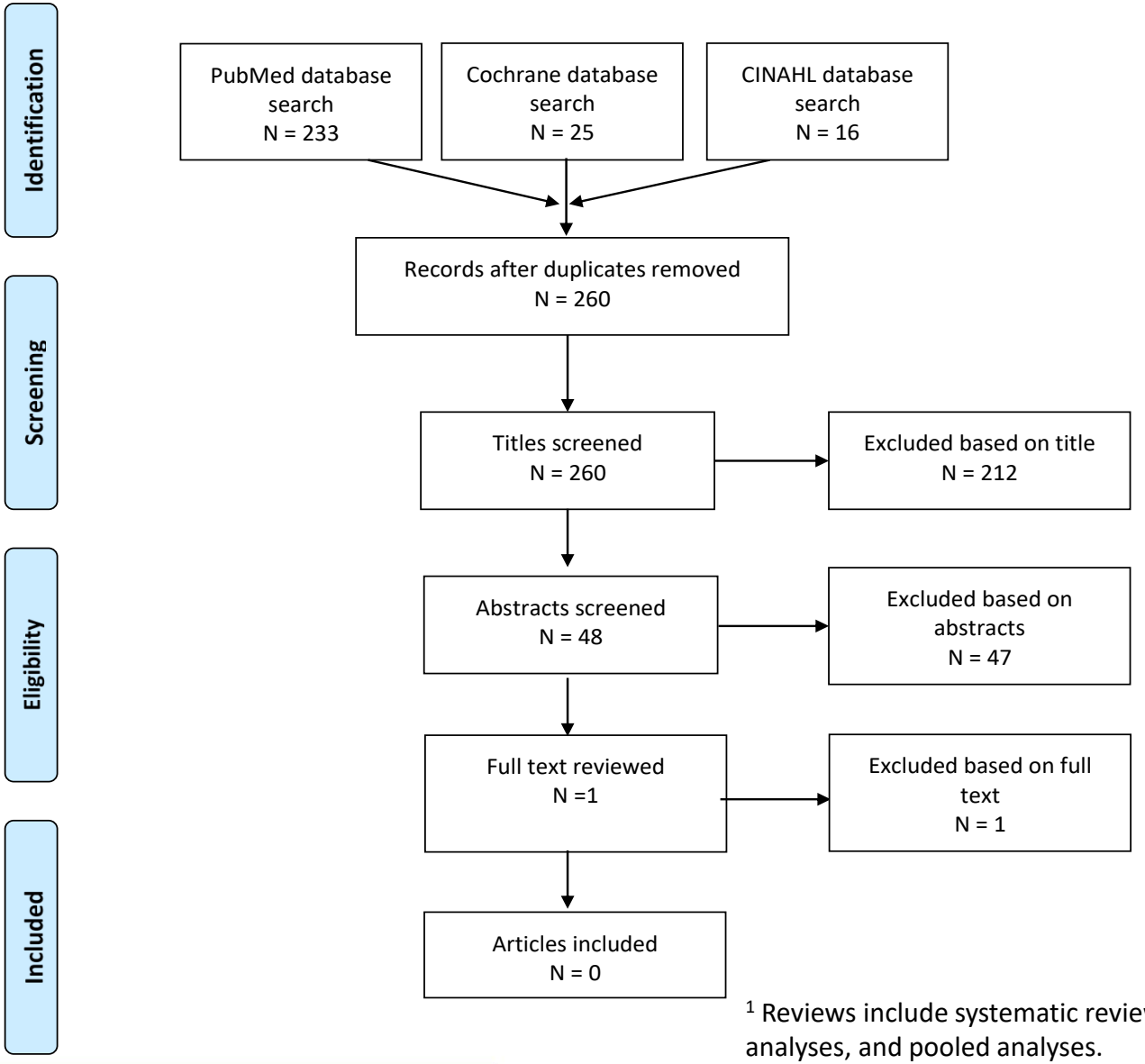
Comparison

Different PA bout durations

Endpoint Health Outcomes

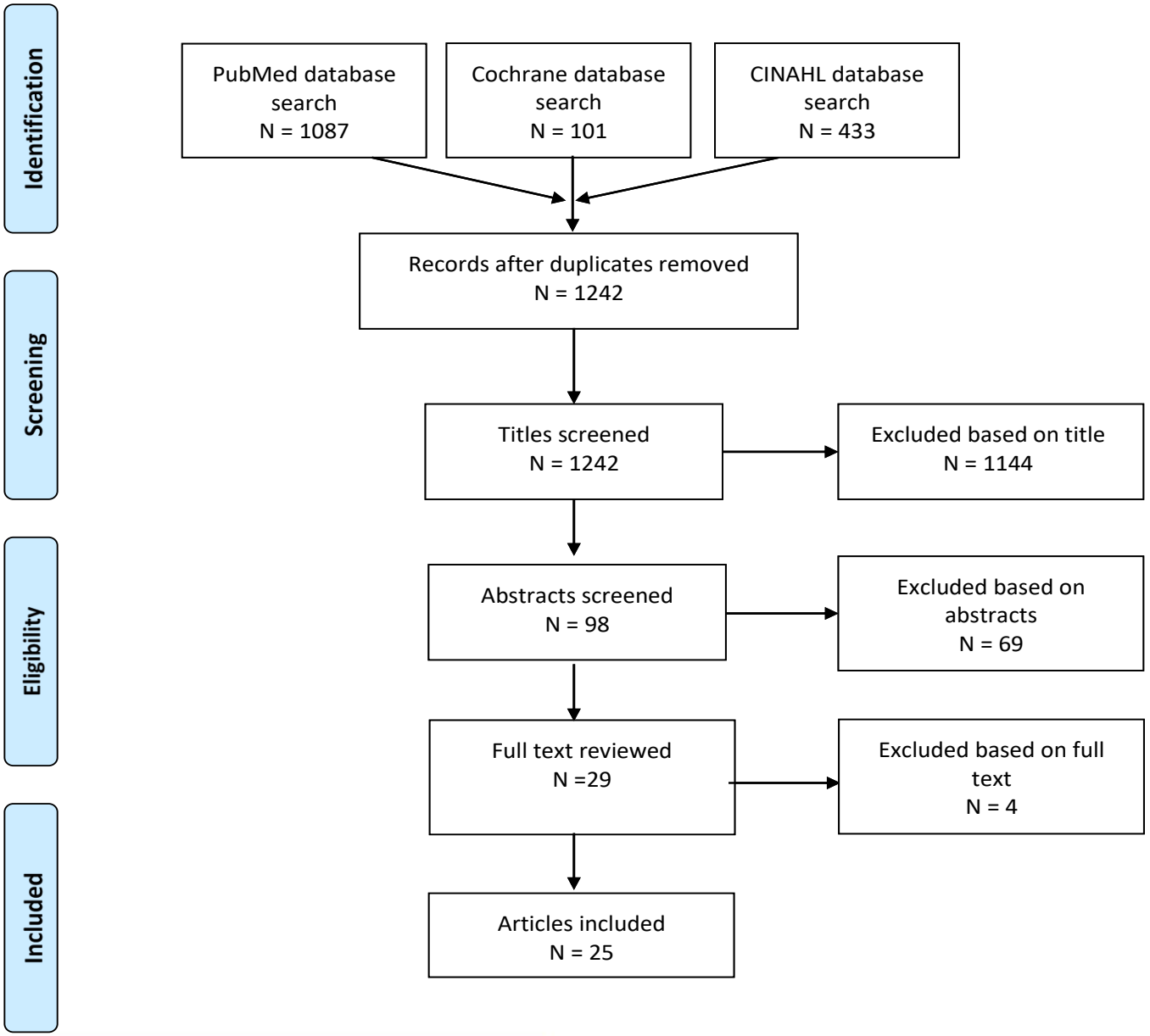
- All-cause and CVD mortality
- CVD incidence
- Incidence of Type 2 Diabetes
- Cardiorespiratory fitness
- Cardio metabolic risk factors:
  - Blood Pressure
  - Blood lipids (total cholesterol, HDL- cholesterol, LDL-cholesterol, triglycerides.
  - Body mass, BMI
  - Waist circumference

Search Results Q5 BOUTS: High-Quality Reviews[1]



[1] Reviews include systematic reviews, meta-analyses, and pooled analyses.

Search Results Q5 BOUTS: Original Research



Description of the Evidence

- 25 papers included representing 23 original research studies
  - Design
    - 12 cross-sectional
    - 2 prospective
    - 11 randomized

Description of the Evidence

Health Outcomes		Cross-Sectional Studies	Prospective Studies	Randomized Studies
Weight or Body Composition	Incidence of Obesity		1	
	Body Mass Index	6		5
	Body Fatness	7		7
Blood Pressure		2	1	5
Lipids	Total Cholesterol			1
	LDL Cholesterol	1		3
	HDL Cholesterol	4	1	4
	Triglycerides	3		3
Glycemic Control	Fasting Blood Glucose	3		2
	Fasting Insulin	2		2
	Oral Glucose Tolerance Test			1
	HbA1c	1		
Metabolic Syndrome		2		
c-Reactive Protein		2		
Framingham Cardiovascular Disease Risk Score		1		

Draft Key Findings

- 10 original randomized studies showed that intermittent bouts ≥10 minutes in duration resulted in similar or enhanced effects when compared to continuous bouts of physical activity of longer duration for outcomes of:
  - Weight and body composition
  - Blood pressure
  - Blood lipids
  - Glucose or insulin

- These studies did not provide information to evaluate bouts of physical activity <10 minutes in duration.

Draft Conclusion Statement

- Conclusion Statement:
  - Strong evidence demonstrates that the accumulation of physical activity in bouts with a duration of at least 10 minutes is associated with cardiometabolic health benefits.

- Grade: Strong

Draft Key Findings

Health Outcomes	Number of Studies where bouts ≥10 minutes in duration was superior to bouts <10 minutes in duration			Number of Studies where bouts <10 minutes in duration was superior to bouts ≥10 minutes in duration			Number of Studies where there was no difference between bouts ≥10 minutes in duration and bouts <10 minutes in duration		
	Cross-Sectional Studies	Prospective Studies	Randomized Studies	Cross-Sectional Studies	Prospective Studies	Randomized Studies	Cross-Sectional Studies	Prospective Studies	Randomized Studies
Incidence of Obesity		1							
Body Mass Index	2			1			3		
Body Fatness	1			1			5		
Blood Pressure				1			1	1	
Total Cholesterol							1		
LDL Cholesterol								1	
HDL Cholesterol		1		1			2		
Triglycerides				1			2		
Fasting Blood Glucose				1			1		
Insulin				1			1		
HbA1c				1					
Metabolic Syndrome							1		
c-Reactive Protein				1			1		
Framingham Cardiovascular Disease Risk Score							1		

Draft Conclusion Statement

- Conclusion Statement:
  - Moderate evidence indicates that the accumulation of physical activity in bouts with a duration of less than 10 minutes is associated with cardiometabolic health benefits.

- Grade: Moderate

Draft Conclusion Statement

- Insufficient evidence is available to determine whether the relationship varies by age, gender, race, ethnicity, SES, BMI.
  - PAGAC Grade: Not assignable

Draft Public Health Impact

- The 2008 Physical Activity Guidelines for Americans recommended that physical activity be accumulated in bouts of at least 10 minutes in duration to influence a variety of health-related outcomes.
  - The evidence reviewed continues to support that physical activity accumulated in bouts of at least 10 minutes in duration can improved a variety of health-related outcomes.
  - There is evidence, mostly from cross-section studies, to suggest that physical activity accumulated in bouts that are less than 10 minutes in duration is associated with favorable health-related outcomes.
- This is of public health importance because
  - Engaging in physical activity, regardless of length of the bout, has health enhancing effects.
  - Individuals who prefer not to or unable to engage in physical activity bouts that are at least 10 minutes in duration can achieved health benefits with shorter bouts of physical activity.

Draft Research Recommendations

- Conduct large research trials with ample sample sizes to allow for stratum-specific analyses to determine whether the influence of physical activity accumulated in bouts of varying length on health outcomes varies by age, sex, race/ethnicity, socio-economic status, or initial weight status.
  - **Rationale:**
    - Little is known about whether the influence of physical activity varies when the exposure to physical activity is consistent across individuals with different demographic characteristics.
    - This information will inform whether physical activity exposure of varying bout length needs to vary by demographic characteristics.
    - May allow for more precise individual-level physical activity recommendations.

Draft Research Recommendations

- To include measurement methods in prospective and randomized studies that will allow for the evaluation of whether physical activity performed in a variety of bout lengths has differential effects on health outcomes.
  - **Rationale:**
    - Randomized studies did not report on physical activity accumulated in bouts that were less than 10 minutes in duration, and only two prospective studies were identified that reported on physical activity accumulated in bout that were less than 10 minutes in duration.
    - There is a need to include physical activity assessment methods that allow for bout length data to be available for analysis.

Draft Research Recommendations

- To conduct meta-analyses and systematic reviews of longitudinal prospective studies to evaluate the effect of physical activity accumulated in varying bout durations and health outcomes.
  - **Rationale:**
    - High quality systematic reviews and meta-analyses were not identified.
    - This resulted in the need to examine individual studies that addressed this topic, particularly related to the literature that examined the health benefits of physical activity accumulated in bouts that are less than 10 minutes in duration.

Committee Discussion

5. **What is the relationship between bout duration of physical activity and health outcomes?**

Question # 6

6. What is the relationship between high intensity interval training and reduction in cardiometabolic risk?
   - Is there a dose-response relationship? If yes, what is the shape of the relationship?
   - Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?
- Source of evidence to answer question:
   - Systematic reviews
   - Meta-analyses

Analytical Framework

Systematic Review Questions

Q6. What is the relationship between high intensity interval training and reduction in cardiometabolic risk?

Population

Adults, 18 years and older

Exposure

- PA performed as high-intensity interval training.

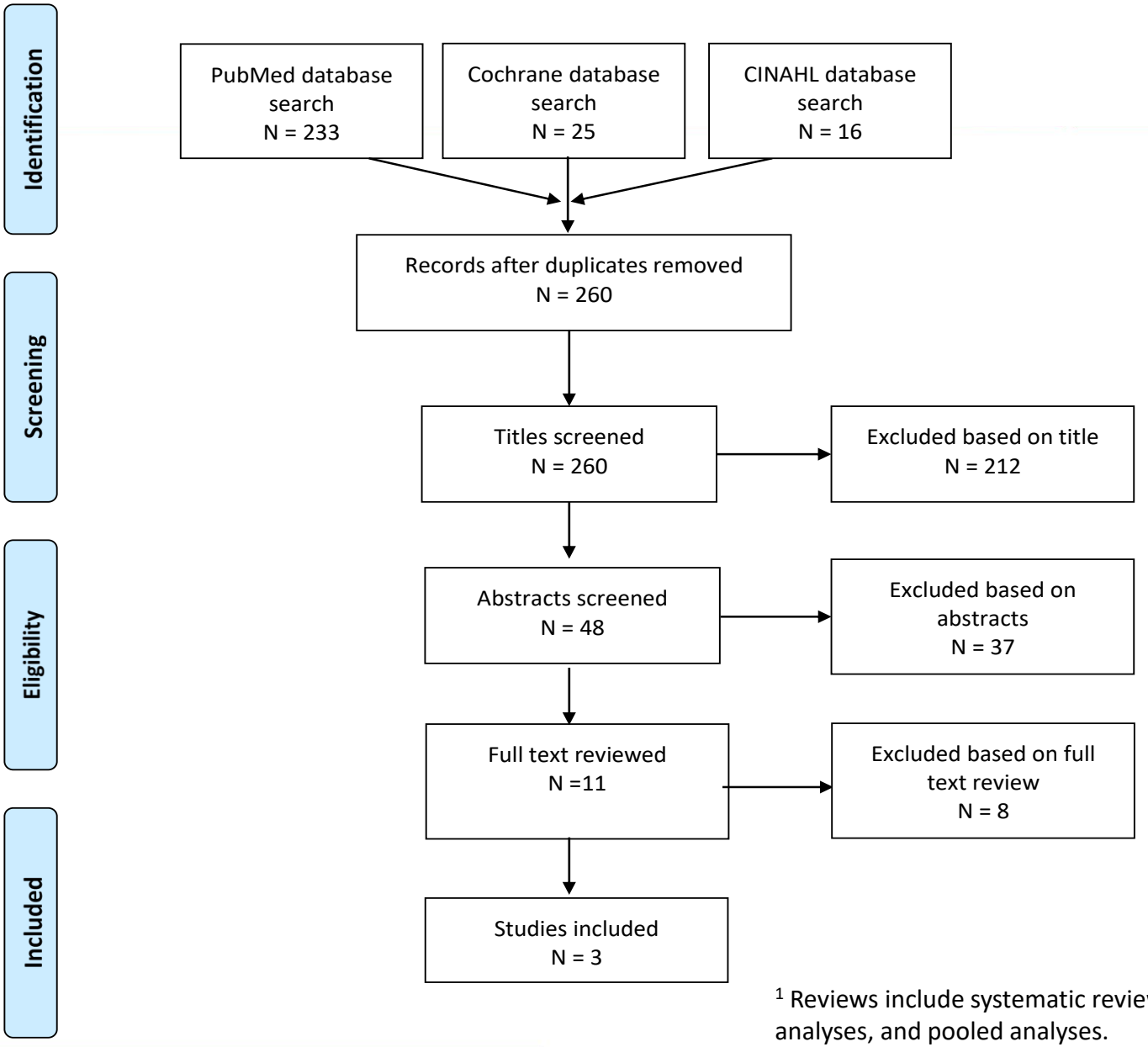
Comparison

- Different PA intensities

Endpoint Health Outcomes

- All-cause and CVD mortality
- CVD incidence
- Incidence of Type 2 Diabetes
- Cardiorespiratory fitness
- Cardio metabolic risk factors:
  - Blood Pressure
  - Blood lipids (total cholesterol, HDL- cholesterol, LDL-cholesterol, triglycerides.
  - Body mass, BMI
  - Waist circumference

Search Results Q6 HIIT: High-Quality Reviews[1]



[1] Reviews include systematic reviews, meta-analyses, and pooled analyses.

Draft Key Findings

- HIIT effectively improves cardiorespiratory fitness (increase VO_2max) in adults with varied body weight and health status [Batacan Jr., et al. 2017; Jelleyman et al. 2015; Kessler et al. 2012].
- HIIT-induced improvements in insulin sensitivity [Jelleyman et al. 2015; Kessler et al. 2012], blood pressure [Batacan Jr., et al. 2017; Kessler et al. 2012], and body composition [Batacan Jr., et al. 2017; Jelleyman et al. 2015; Kessler et al. 2012] more consistently occur in adults with overweight/obesity status and (or) high risk for cardiovascular disease and diabetes, especially with training ≥12 weeks.
- Healthy adults with normal weight status and lower risk for cardiometabolic disease do not typically show improvements in insulin sensitivity, blood pressure and body composition with HIIT. Blood lipids and lipoproteins apparently are not influenced by HIIT.

Draft Conclusion Statement

- **Overall Conclusion**

Moderate evidence indicates that high-intensity interval training (HIIT) can effectively improve insulin sensitivity, blood pressure, and body composition in adults. These HIIT-induced improvements in cardiometabolic disease risk factors are comparable to those resulting from continuous, moderate-intensity aerobic exercise and are more likely to occur in adults at higher risk for cardiovascular disease and diabetes, compared to healthy adults.

Grade: Moderate

Draft Conclusion Statement

- **Dose-response**

Insufficient evidence is available to determine whether a dose-response relationship exists between the quantity of HIIT and several risk factors for cardiovascular disease and diabetes.

Grade: Grade not assignable

- **Age, gender, race/ethnicity, socioeconomic status:**

Insufficient evidence is available to determine whether the effects of HIIT on cardiometabolic risk factors are influenced by age, sex, race/ethnicity, or socio-economic status.

Grade: Grade not assignable

Draft Conclusion Statement

- **Weight status**

Moderate evidence indicates that weight status influences the effectiveness of HIIT to reduce cardiometabolic disease risk; adults with overweight or obesity are more responsive than adults with normal weight to improve insulin sensitivity, blood pressure, and body composition.

Grade: Moderate

Draft Research Recommendations

1. **Longer-term randomized controlled trials are needed to assess the effects of HIIT on physiological, morphological, and cardiometabolic health outcomes.** These randomized controlled trials should include racially/ethnically diverse groups of adults who are overweight or obese and (or) at high risk for cardiovascular disease or type 2 diabetes.

Rationale: The majority of HIIT intervention periods are <12 weeks, which may be insufficient time to assess the magnitude and sustainability of clinically-important changes in some physiological, morphological, and cardiometabolic health outcomes. Prescriptively designing these studies to include participants with diverse race/ethnic, socio-economic, age and sex characteristics is important to broaden the applicable proportion of the U.S. adult population.

Draft Research Recommendations

2. Randomized controlled trials are needed to assess dose-response relationships between duration of HIIT and changes in cardiometabolic disease risk factors.

Rationale: At present, information on dose-response relationships between HIIT and changes in cardiometabolic disease risk factors cannot be determined due to limited results from secondary analyses of data, i.e. meta-regression analyses.

Draft Research Recommendations

3. **Research is needed to systematically assess adverse events, including musculoskeletal injuries, attributable to HIIT, compared to other types of exercise training, among adults with a wide variety of health and disease characteristics.**

Rationale: At present, evaluation of the safety of HIIT among adults with varied health and disease characteristics is compromised by the limited data available, in part, due to the low proportion of studies reporting adverse events.

4. **Research is needed to determine longer-term adherence to HIIT programs, compared to other types of physical activity programs, among adults with varied health and disease characteristics.**

Rationale: Are people willing and able to adhere to HIIT programs? Knowledge gained from this type of research will inform health promotion practitioners and policy leaders on the utility of recommending HIIT for health.

Committee Discussion

- What is the relationship between high intensity interval training and reduction in cardiometabolic risk?
  - Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - Does the relationship vary by age, sex, race/ethnicity, socio-economic status, or weight status?

Meeting 5

For Discussion in Subcommittees

MVPA and Steps Equivalents

MVPA
10,000 steps ~= 10 km ~= 6.0 miles
11,000 steps ~= 11 km ~= 6.6 miles = 1h at 6.6 miles per hour
2h at 3.3 miles per hour
x 7 days = 14h = 840 minutes/150
= 5.6 x goal = 56 MET-h/(moderate)
If baseline = 4,000
12,500 steps per day ~= 8,500 steps MVPA ~= 43 Met-h/w = 4.3 x goal

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3.5 x goal – 35 MET-h/w ~= 525 min/7 = 75 minutes per day (moderate)
= 6875 steps (35/56 x 11,000)
Add 4,000 = 10,875
Add 5,000 = 11,875

1 MET-HR = 210 mL/kg = 0.210 L/kg = 1·05 kcal/kg
10 MET-HR/w = 700 kcal/w for 70 kg man or woman