Meeting 5

Cardiometabolic Health and Weight Management

Chair: John Jakicic

Members: Wayne Campbell, Loretta DiPietro, Russ Pate, Linda Pescatello, Ken Powell

Experts and Consultants

- Consultant:
  - Ronald J. Sigal, M.D., M.P.H.

    University of Calgary

Subcommittee Questions

1. What is the relationship between physical activity and prevention of weight gain?

2. In people with normal blood pressure or pre-hypertension, what is the relationship between physical activity and blood pressure?

3. In adults without diabetes, what is the relationship between physical activity and incidence of type 2 diabetes?

Question #2

In people with normal blood pressure or pre-hypertension, what is the relationship between physical activity and blood pressure?*

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, weight status, or resting blood pressure level?
c. Does the relationship vary based on: frequency, duration, intensity, type (mode), or how physical activity is measured?

- Source of evidence to answer question:
  - SR/MA/Existing Report

*Subquestions a, b, and c were addressed during the July meeting

Draft Key Findings: Physical Activity and Blood Pressure

- There were 8 meta-analyses of randomized clinical control trials that examined the blood pressure response to physical activity among sedentary adults with prehypertension and normal blood pressure [Carlson, 2014; Cornelissen, 2011, 2013b; Corso, 2016; Fagard 2007; MacDonald, 2016; Murtagh, 2015].
  - 5 of the meta-analyses included adults with prehypertension [Cornelissen, 2011, 2013b; Corso, 2016; MacDonald, 2016; Murtagh, 2015].
  - 7 of the meta-analyses included adults with normal blood pressure [Casonatto, 2016; Carlson, 2014; Cornelissen, 2011, 2013b; Corso, 2016; Fagard 2007; MacDonald, 2016].

Draft Key Findings: Physical Activity and Blood Pressure

- In the 5 meta-analyses involving adults with prehypertension, 5 reported a statistically significant reduction in systolic blood pressure and 4 reported a statistically significant reduction in diastolic blood pressure.
- In the 7 meta-analyses involving adults with normal blood pressure 3 reported a statistically significant reduction and 1 reported a statistically significant rise in systolic blood pressure; and 6 reported a statistically significant reduction in diastolic blood pressure
- The magnitude of the reductions ranged from 2 to 5 mmHg for systolic blood pressure and 1 to 4 mmHg for diastolic blood pressure.
- The magnitude of these blood pressure reductions may be sufficient to reduce the:
  - Resting blood pressure of some samples with prehypertension into normotensive ranges.
  - Risk of coronary heart disease 4 percent to 5 percent and stroke by 6 percent to 8 percent among adults with prehypertension and normal blood pressure

Draft Key Findings: Physical Activity and Blood Pressure

- In a meta-analysis among 136,846 adults initially free of hypertension at baseline (i.e., those with normal blood pressure) Huai et al. [2013] reported:
  - 11.4% adults developed hypertension after an average of 10 years (2 to 45 years) of follow up.
  - "High" amounts of leisure-time physical activity (i.e., volume and/or intensity) were associated with a 19% lower risk of hypertension compared to the reference group engaging in "low" leisure-time physical activity (RR 0.81 [95% CI 0.76-0.85]).
  - Moderate amounts of recreational physical activity were associated with a 11 percent decreased risk of hypertension compared to lower amounts of recreational physical activity (RR 0.89 [95% CI, 0.85-0.94]).
  - No significant associations were found with occupational and commuting physical activity and incident hypertension.

Draft Conclusion Statement

- Strong evidence demonstrates that physical activity reduces blood pressure among adults with prehypertension and normal blood pressure. **PAGAC Grade: Strong**

Committee Discussion

In people with normal blood pressure or pre-hypertension, what is the relationship between physical activity and blood pressure?

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, weight status, or resting blood pressure level?
c. Does the relationship vary based on: frequency, duration, intensity, type (mode), or how physical activity is measured?

Question #3

In adults without diabetes, what is the relationship between physical activity and the incidence of type 2 diabetes?

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. Does the relationship vary based on: frequency, duration, intensity, type (mode), and how physical activity is measured?

- Source of evidence to answer question:
  - SR/MA/Existing Report

Analytical Framework

Systematic Review Question

In adults without diabetes, what is the relationship between physical activity and the incidence of type 2 diabetes?

Target Population

Adults, ages 18 and older

Comparison

Adults who participate in varying levels of physical activity, including no reported physical activity

Intervention/Exposure

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

Endpoint Health Outcomes

Type 2 diabetes

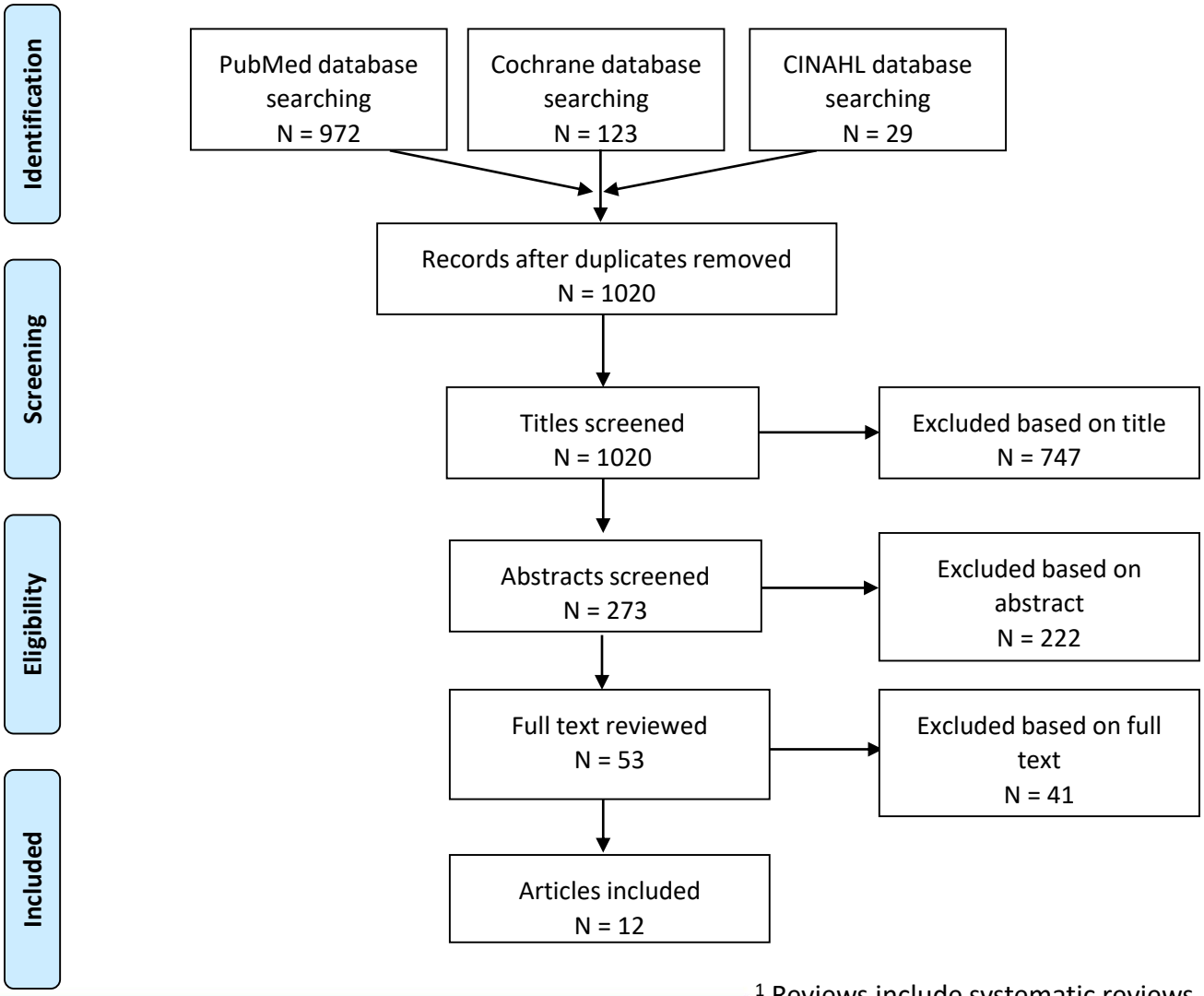
Key Definitions

Non-diabetic/normal: Having an A1C below 5.7%, fasting blood glucose less than 100 mg/dL, and an OGTT 2 hour blood glucose lower than 140 mg/dL.

Prediabetes: Having an A1C of 5.7%–6.4%, or fasting blood glucose of 100–125 mg/dl, or and/or an OGTT 2 hour blood glucose of 140 mg/dL–199 mg/dL with fasting blood glucose <126 mg/dL.

Diabetes: Having an A1C of 6.5% or higher, fasting blood glucose of 126 mg/dL or higher, and/or an OGTT 2 hour blood glucose of 200 mg/dL or higher.

Search Results: High-Quality Reviews[1]



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

Description of the Evidence

- 12 reviews
  - Type of review
    - 7 Meta-analyses
    - 4 Systematic reviews
    - 1 pooled analysis
  - Study designs included in the reviews
    - 10 reviews with only cohort studies
    - 1 review with cohort and experimental studies
    - 1 review with cohort, experimental, and case-control studies

Description of the Evidence

- Studies per review:
  - Range of 2 - 81, median 8.5
- Total # subjects per review (8 reviews):
  - Range of 4500 - ~300,000, median 140,000 subjects
- Age of subjects:
  - Average age (3 studies): 50, 50, and 52 years of age

Description of the Evidence

- Physical activity
  - Mostly leisure-time MVPA
  - 4/12 included other domains: transportation, occupational, household

- Dose-response
  - 5 meta-analyses provided point estimates for 3+ volumes of physical activity

Draft Key Findings

- All 12 reviews reported an inverse relationship between volume of physical activity and risk of incident type 2 diabetes.

Draft Key Findings

- High versus low risk estimates, 4 reviews and 1 systematic review:

0.45 (0.31, 0.77)

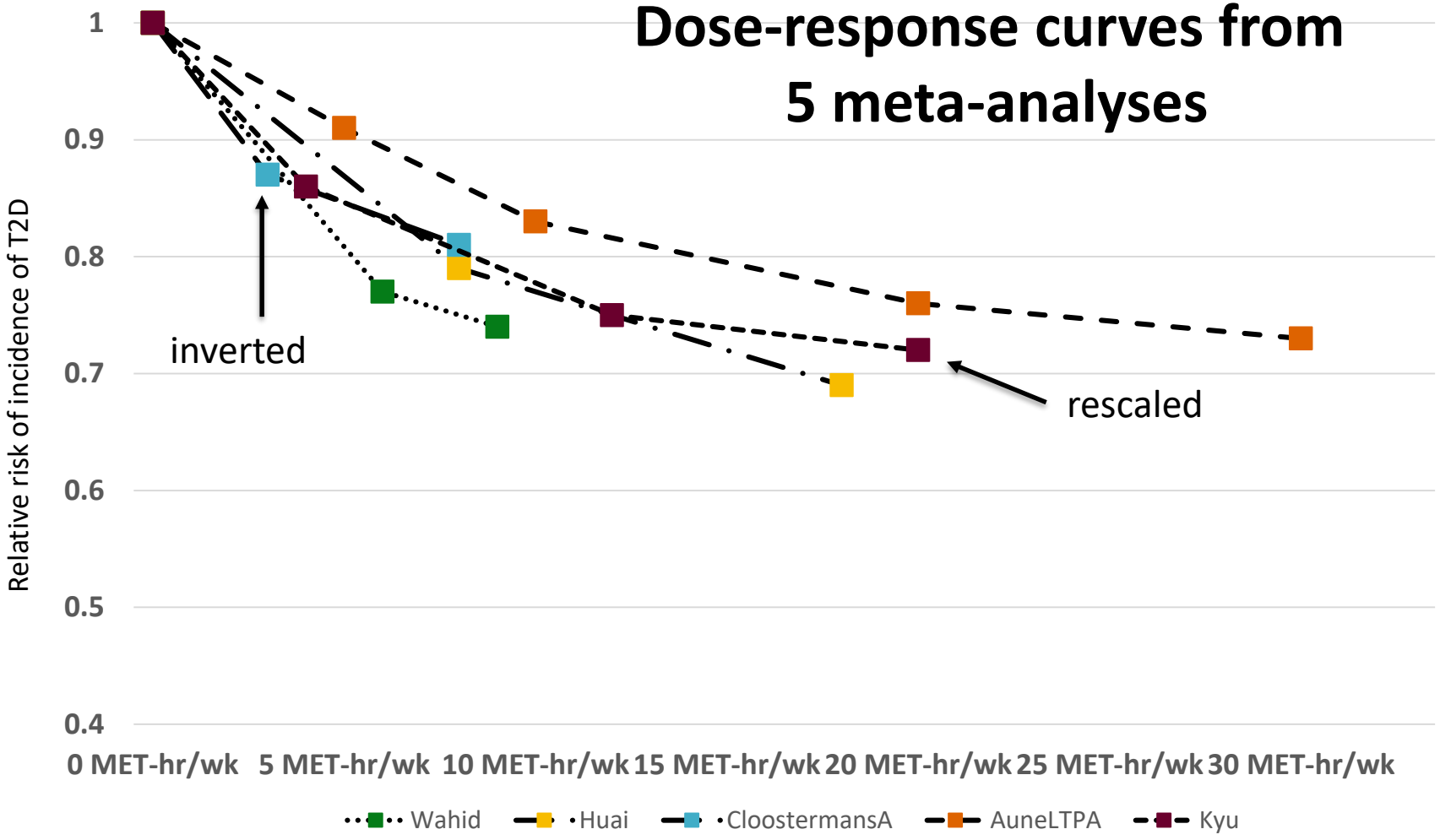
0.53 (0.40, 0.70)

0.58 (no 95% CI)

0.65 (0.59, 0.71)

0.83 (0.76, 0.90)

Draft Key Findings



Draft Key Findings

- One systematic review and one meta-analysis presented information regarding the effect of weight status on the relationship between physical activity and type 2 diabetes.

- No evidence of effect modification

Draft Conclusion Statement

- Strong evidence demonstrates an inverse relationship between volume of moderate to vigorous physical activity and incidence of type 2 diabetes.
  PAGAC Grade: Strong

Draft Conclusion Statement

- Strong evidence demonstrates the existence of an inverse, curvilinear *dose-response* relationship between volume of physical activity and incidence of type 2 diabetes, with a decreasing slope at higher levels of physical activity.

PAGAC Grade: Strong

Draft Conclusion Statement

- Moderate evidence indicates that the inverse relationship between volume of physical activity and risk of type 2 diabetes does not vary by weight status. **PAGAC Grade: Moderate**

Draft Conclusion Statement

- Limited evidence suggests that the relationship between higher volume of physical activity and lower incidence of type 2 diabetes is not influenced by age, sex, or race ethnicity. **PAGAC Grade: Limited**

- Insufficient evidence is available to determine if the relationship between physical activity and the incidence of type 2 diabetes varies by socioeconomic status. **PAGAC Grade: Grade not assignable**

- Insufficient evidence exists to determine whether the relationship between physical activity and the incidence of type 2 diabetes varies by the frequency, intensity, duration, or type of physical activity, or how physical activity is measured. **PAGAC Grade: Grade not assignable**

Draft Research Recommendations

- Determine the value of different types (e.g., strength, alternative) and intensities (e.g., light, vigorous) of physical activity on the incidence of type 2 diabetes.
- Determine whether the relationship between physical activity and risk of type 2 diabetes varies by age, sex, race/ethnicity, and socio-economic status.

Committee Discussion

In adults without diabetes, what is the relationship between physical activity and the incidence of type 2 diabetes?

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. Does the relationship vary based on: frequency, duration, intensity, type (mode), and how physical activity is measured?

Next Steps

- Final edits to Q1 document (including tables)
- Final edits to Q2 document (including tables)
- Final edits to Q3 document (including tables)
  - Initial review by Anne Rodgers
- Integration of full document for final report