



Meeting 4

# Youth

**Chair: Russ Pate**

Members: Chuck Hillman, Kathy Janz, Peter Katzmarzyk, Ken Powell, Melicia Whitt-Glover

# Experts and Consultants



- Invited experts: None.
- Consultants: None.

# Subcommittee Questions



1. In children under age 6, is physical activity related to health outcomes?
2. In children and adolescents, is physical activity related to health outcomes?
3. In children and adolescents, is sedentary behavior related to health outcomes?

# Question #1

1. In children under age 6, is physical activity related to health outcomes?
  - a. What is the relationship between physical activity and adiposity/weight status?
  - b. What is the relationship between physical activity and bone health?
  - c. What is the relationship between physical activity and cardiometabolic health?
  - d. Are there dose-response relationships? If yes, what are the shapes of those relationships?
  - e. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?
  
- Source of evidence to answer question
  - De novo systematic review of original articles

# Analytical Framework

## Systematic Review Question

In children under age 6, is physical activity related to health outcomes?

## Target Population

Children, ages 0–6

## Comparison

Least active subgroup

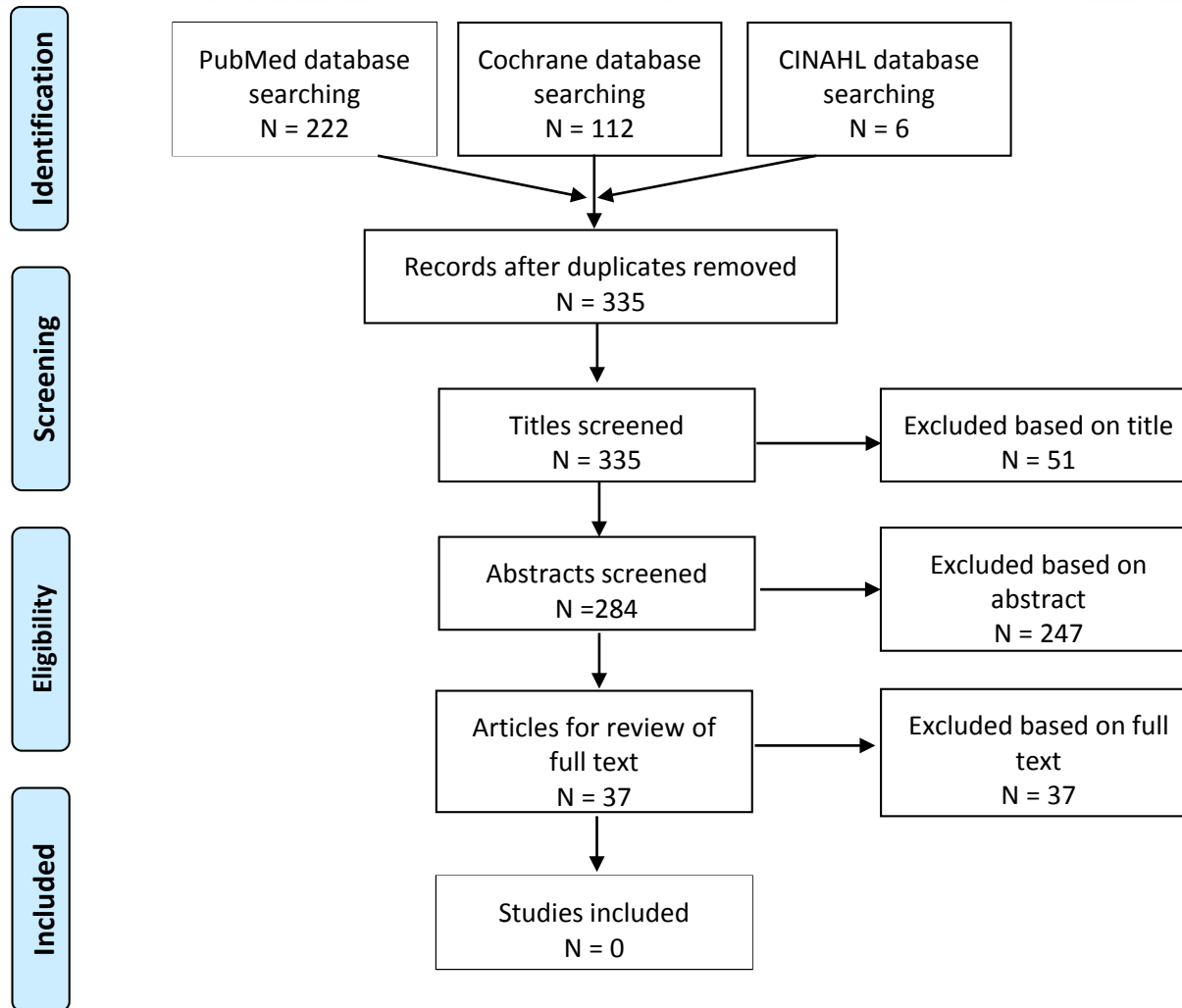
## Intervention/Exposure

All types and intensities of physical activity, including any kind of play (structured or free), sports, and other activities

## Endpoint Health Outcomes

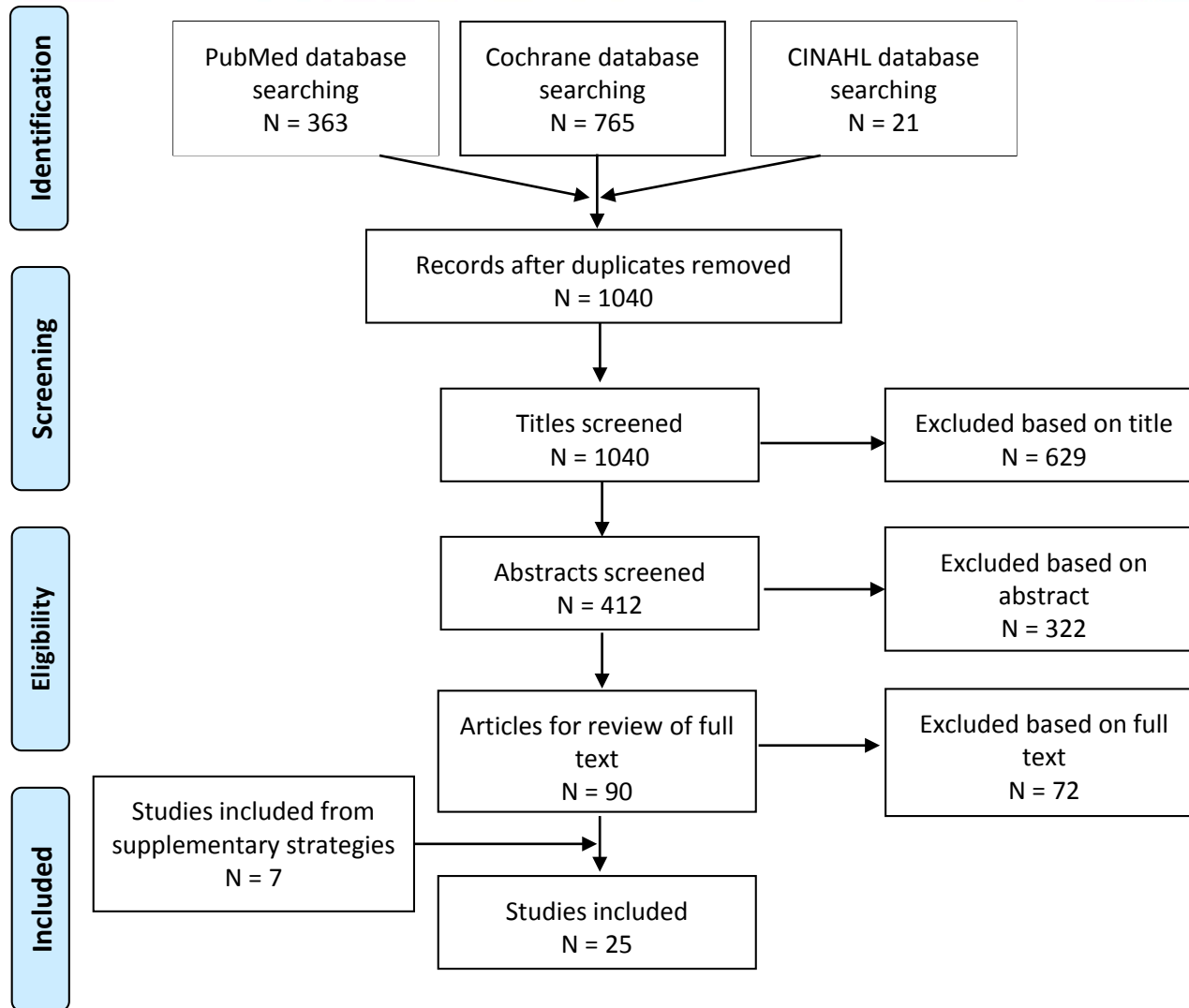
- Adiposity
- Asthma
- Blood pressure
- Body composition
- Bone, bone mineral content, bone geometry, bone mineral density
- Fatness
- Gross motor movement
- Gross motor skill development
- Growth
- Motor skill competence
- Muscle mass, lean mass
- Musculoskeletal development and fitness
- Physical fitness
- Weight (underweight, normal, overweight, obese)
- Weight status
- Weight trajectory change
- Cardiometabolic risk factors

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



<sup>1</sup> Reviews include systematic reviews, meta-analyses, and pooled analyses.

# Search Results: Original Research



# Question #1

- In children under age 6, is physical activity related to health outcomes?



# Draft Conclusion Statement



- **Conclusion Statement:**  
Strong evidence demonstrates that higher amounts of physical activity are associated with more favorable indicators of bone health and with reduced risk for excessive increases in body weight and adiposity in children 3-6 years of age.
  
- **Grade: Strong**

# Question 1 – Subquestion a



- a. What is the relationship between physical activity and adiposity/weight status?

# Draft Key Findings



- **Body Weight and Adiposity**
  - Strong evidence demonstrates that higher amounts of physical activity are associated with a reduced risk of excessive increases in body weight and adiposity in children ages 3 to 6 years.

# Description of the Evidence



- **Body Weight and Adiposity**
  - 13 Prospective observational studies
  - Objectively measured physical activity
  - 8 of the studies found negative associations between physical activity and weight and/or adiposity
  - Evidence not sufficient to identify a particular dose

# Question 1– Subquestion b

b. What is the relationship between physical activity and bone health?

# *Draft Key Findings*



- **Bone Health**
  - Strong evidence demonstrates that higher amounts of physical activity are associated with favorable indicators of bone health in children ages 3 to 6 years.

# Description of the Evidence



- Bone Health
  - 10 papers representing 4 studies
  - Randomized clinical trials and prospective observational study design
  - All studies utilized state-of-the-art bone imaging procedures
  - Studies found physical activity is positively associated with stronger bone
  - Evidence not sufficient to identify a particular dose

# Question 1 – Subquestion c



c. What is the relationship between physical activity and cardiometabolic health?



# Draft Key Findings



- **Cardiometabolic Risk Factors**
  - Available evidence is insufficient to determine the effects of physical activity on cardiometabolic risk factors in children ages 3 to 6 years.

# Description of the Evidence



- **Cardiometabolic Risk Factors**
  - 3 prospective cohort studies
  - Evidence not sufficient to determine a relationship between physical activity and cardiometabolic risk factors

# Question 1 – Subquestion d

d. Are there dose-response relationships?  
If yes, what are the shapes of those relationships?

# *Draft Key Findings*

- **Dose-Response**
  - Available evidence is insufficient to determine the dose-response relationship between physical activity and health effects in children ages 3 to 6 years.

# Question 1 – Subquestion e

e. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?

# Draft Key Findings



- **Demographic Effect Modifiers**
  - Available evidence is insufficient to determine whether the relationship between physical activity and health effects in children ages 3 to 6 years is moderated by age, sex, race/ethnicity, or socio-economic status.

# Draft Research Recommendations

- Conduct research on the health effects of physical activity in children younger than 6 years in the following areas:
  - Randomized clinical trials to elucidate the dose-response relationships for physical activity and bone health, and for physical activity and adiposity.
  - Prospective observational and experimental studies examining the effects of physical activity on cardiometabolic risk factors, including insulin sensitivity, blood lipids, and blood pressure.

# Draft Research Recommendations

- Studies to determine whether the health effects of physical activity in young children differ across groups based on sex, race/ethnicity, and socioeconomic status.
- Studies to examine the health effects of physical activity in very young children between birth and age 3 years.
- Develop valid instruments to measure physical activity in children between birth and age 2 years.



# Committee Discussion



1. In children under age 6, is physical activity related to health outcomes?
  - a. What is the relationship between physical activity and adiposity/weight status?
  - b. What is the relationship between physical activity and bone health?
  - c. What is the relationship between physical activity and cardiometabolic health?
  - d. Are there dose-response relationships? If yes, what are the shapes of those relationships?
  - e. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?

# Question #2

2. In children and adolescents, is physical activity related to health outcomes?
  - a. What is the relationship between physical activity and cardiorespiratory and muscular fitness?
  - b. What is the relationship between physical activity and adiposity/weight status? Does physical activity prevent or reduce the risk of excessive increases in adiposity/weight?
  - c. What is the relationship between physical activity and cardiometabolic health?
  - d. What is the relationship between physical activity and bone health?
  - e. Do the relationships vary based on type and/or intensity of physical activity?
  - f. Are there dose-response relationships? If so, what are the shapes of those relationships?
  - g. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?
- Source of evidence to answer question
  - SR/MA/Existing Report

# Analytical Framework

## Systematic Review Question

In children and adolescents, is physical activity related to health outcomes?

## Target Population

Children, ages 0–18

## Comparison

Least active subgroup

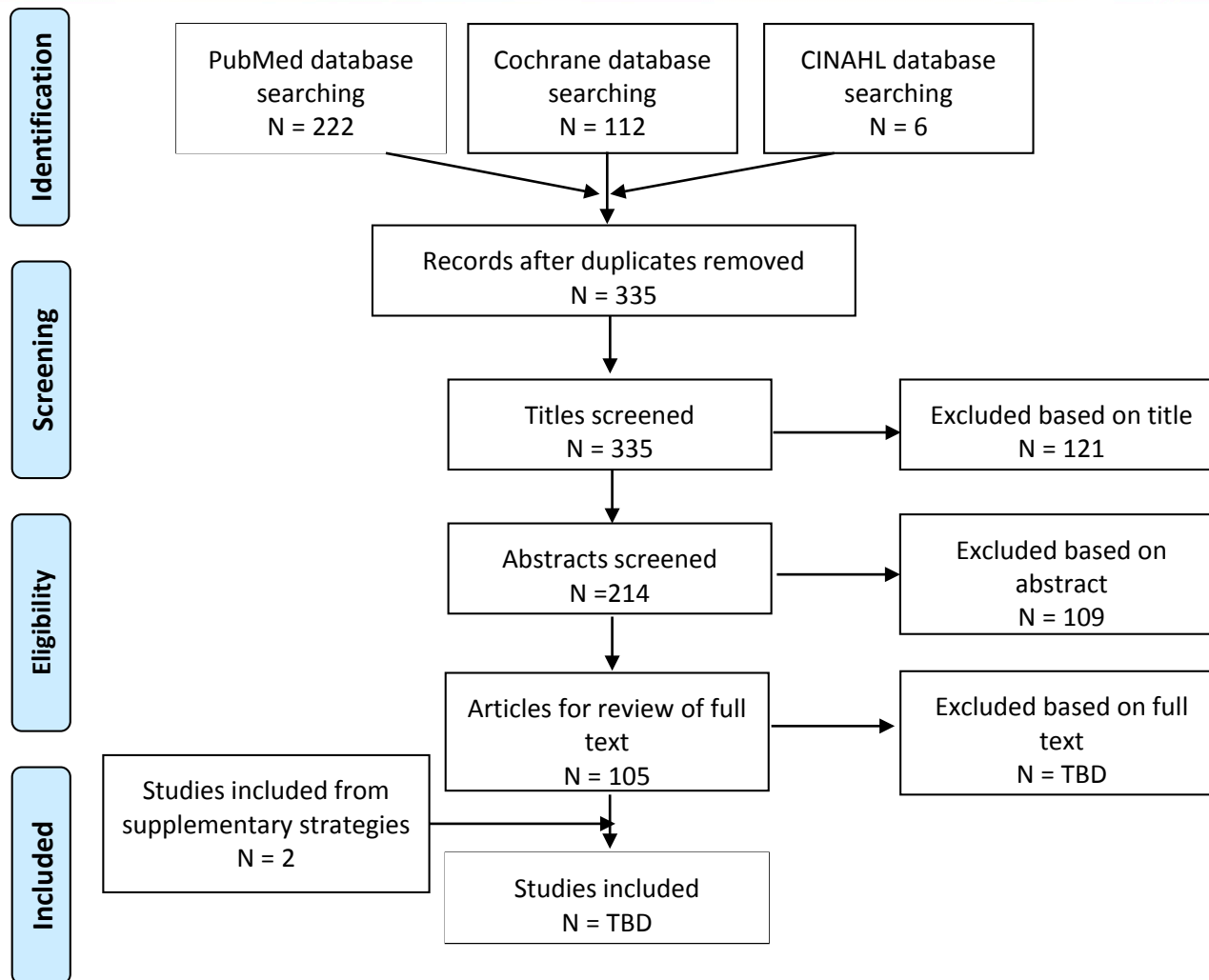
## Intervention/Exposure

All types and intensities of physical activity, including any kind of play (structured or free), sports, and other activities

## Endpoint Health Outcomes

- Bone density
- Bone strength
- Cardiorespiratory fitness
- Cardiometabolic risk factors
  - Blood pressure
  - Dyslipidemia
  - Glucose
  - Insulin resistance
  - Waist circumference
- Musculoskeletal health
- Obesity
- Overweight
- Weight gain

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



<sup>1</sup> Reviews include systematic reviews, meta-analyses, and pooled analyses.

# Question 2

## Subcommittee Member Assignments

In children and adolescents, is physical activity related to health outcomes?

- a. What is the relationship between physical activity and cardiorespiratory and muscular fitness?
  - Whitt-Glover, Hillman, Janz
- b. What is the relationship between physical activity and adiposity/weight status? Does physical activity prevent or reduce the risk of excessive increases in adiposity/weight?
  - Pate, Katzmarzyk

# Question 2

## Subcommittee Member Assignments

In children and adolescents, is physical activity related to health outcomes?

- c. What is the relationship between physical activity and cardiometabolic health?
  - Katzmarzyk, Powell
- d. What is the relationship between physical activity and bone health?
  - Janz, Whitt-Glover, Hillman

# Question 2

## Subcommittee Member Assignments

In children and adolescents, is physical activity related to health outcomes?

- e. Do the relationships vary based on type and/or intensity of physical activity?
- f. Are there dose-response relationships? If so, what are the shapes of those relationships?
- g. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?
  - Pate, Powell (e-g)

# Committee Discussion

## 2. In children and adolescents, is physical activity related to health outcomes?

- a. What is the relationship between physical activity and cardiorespiratory and muscular fitness?
- b. What is the relationship between physical activity and adiposity/weight status? Does physical activity prevent or reduce the risk of excessive increases in adiposity/weight?
- c. What is the relationship between physical activity and cardiometabolic health?
- d. What is the relationship between physical activity and bone health?
- e. Do the relationships vary based on type and/or intensity of physical activity?
- f. Are there dose-response relationships? If so, what are the shapes of those relationships?
- g. Do the relationships vary by age, sex, race/ethnicity or socio-economic status?



# Question #3

3. In children and adolescents, is sedentary behavior related to health outcomes?
  - a. What is the relationship between sedentary behavior and weight status/adiposity?
  - b. Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - c. Does the relationship vary by age, sex, race/ethnicity, or socio-economic status?
  - d. Is the relationship independent of light, moderate, or vigorous intensity physical activity?
- Source of evidence to answer question
  - SR/MA/Existing Report
  - De novo systematic review of original articles (TBD)

# Analytical Framework

## Systematic Review Question

In children and adolescents, is sedentary behavior related to health outcomes?

## Target Population

Children, ages 0–18

## Comparison

Youth who participate in varying levels and types of sedentary behavior

## Intervention/Exposure

All types of sedentary behavior, including total sitting time, screen time, leisure-time sitting, and objective measures of sedentary time (e.g., accelerometers, heart rate monitors)

## Endpoint Health Outcomes

- Bone density
- Bone strength
- Cardiorespiratory fitness
- Cardiometabolic risk factors
  - Blood pressure
  - Dyslipidemia
  - Glucose
  - Insulin resistance
  - Waist circumference
- Musculoskeletal health
- Obesity
- Overweight
- Weight gain

# Common Inclusion/ Exclusion Criteria



- Language
  - Exclude: Studies that do not have full text in English
- Publication Status
  - Include: Studies published in peer-reviewed journals, PAGAC-approved reports
  - Exclude: Grey literature
- Study Subjects
  - Exclude: Studies of animals only

# Inclusion/Exclusion Criteria



- Date of Publication
  - Original Research: Anytime
  - Existing Sources: Include 2006–Present
- Study Subjects
  - Include: Children ages 0–18
- Study Design
  - Include: Randomized controlled trials, Non-randomized controlled trials, Prospective cohort studies, Retrospective cohort studies, Case-control studies, Before-and-after studies, Time series, Systematic reviews, Meta-analyses, Pooled analyses, PAGAC-Approved reports
  - Exclude: Narrative reviews, Commentaries, Editorials, Cross-sectional, Study protocol
- Exposure/Intervention
  - Include: All types of sedentary behavior
  - Exclude: Studies that do not include sedentary behavior as the primary exposure variable or used solely as a confounding variable
- Outcome
  - Include: Bone density, Bone strength, Cardiorespiratory fitness, Cardiometabolic risk factors (Blood pressure, Dyslipidemia, Glucose, Insulin resistance, Waist circumference), Musculoskeletal health, Obesity, Overweight, Weight gain

# Search Terms: Physical Activity



Active games

Active play

Active recreation

Free play

High intensity activity(ies)

Low intensity activity(ies)

Moderate to vigorous activity(ies)

Muscle-strengthening

Outdoor play

Play and playthings

Recess

Recreational activity(ies)

Screen time

Television (TV) viewing

Television (TV) watching

Tummy Time

Video game

Video gaming

Vigorous activity(ies)

Walk

Youth sports

# Search Terms: Outcome

Adiposity

Asthma

Blood glucose

Blood lipids

Blood pressure

Body composition

Body Mass Index

BMI

Bone density

Bone geometry

Bone mineral content

Bone mineral density

Cardiometabolic risk factor(s)

Diabetes Mellitus, Type 2

Dyslipidemia(s)

Fatness

Hyperglycemia

Hypertension

Insulin resistance

Metabolic syndrome

Metabolic syndrome X

Muscle mass

Musculoskeletal development

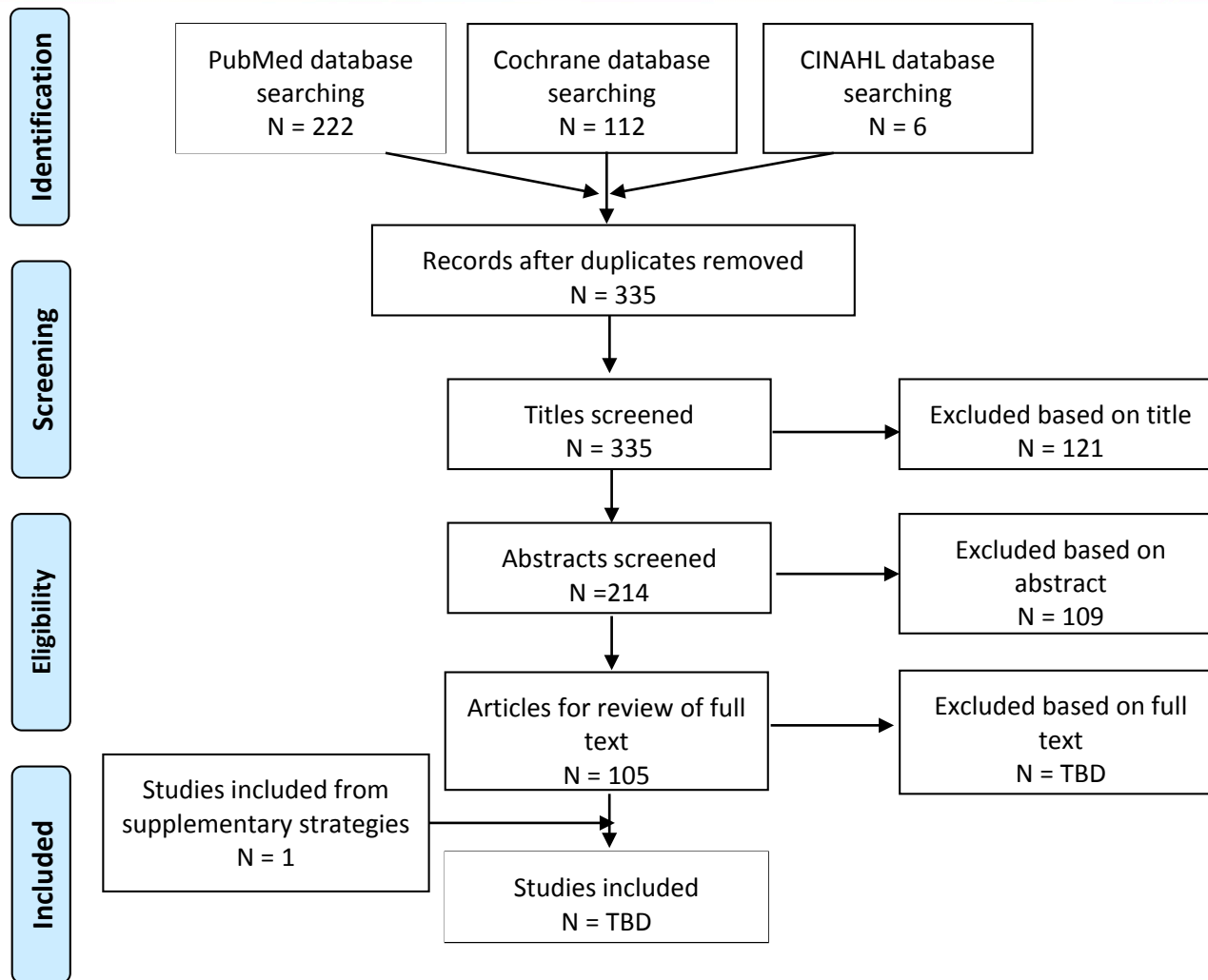
Musculoskeletal fitness

Obese

Obesity

Type 2 Diabetes

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



<sup>1</sup> Reviews include systematic reviews, meta-analyses, and pooled analyses.

# Committee Discussion

3. In children and adolescents, is sedentary behavior related to health outcomes?
  - a. What is the relationship between sedentary behavior and weight status/adiposity?
  - b. Is there a dose-response relationship? If yes, what is the shape of the relationship?
  - c. Does the relationship vary by age, sex, race/ethnicity, or socio-economic status?
  - d. Is the relationship independent of light, moderate, or vigorous intensity physical activity?



# Next Steps



- Question 3: In children and adolescents, is sedentary behavior related to health outcomes?

