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Psychosocial Factors in Health and Illness

Week 2

Physical activity

Learning outcomes

- Define physical activity
- Compare existing physical activity assessment methods
- Learn about different frameworks used to understand how physical activity is enacted
- Use these frameworks to describe research findings of a recent study evaluating various physical activity interventions
- Learn about methods used to develop and evaluate physical activity interventions
- Critically appraise public campaigns developed to promote physical activity

Physical activity definition

- **Physical activity** is defined as any bodily movement produced by skeletal muscles that require energy expenditure (METs)
- **Metabolic equivalents of task (MET)** are multiples of the resting metabolism reflecting metabolic rate during physical activity. The standard MET is 3.5 ml/min/kg and is expended when sitting still
- **Intensity:** Sedentary (1 MET), moderate (MET of 3-6) , and vigorous (MET >6)
- **Exercise** is a subset of physical activity defined as deliberate and structured physical activity (e.g., aerobic, muscle-strengthening, bone-strengthening, and stretching)
- **Modes/types of physical activity:** activities of daily living (ADL), household tasks, exercise, leisure activities, sports, walking and running.

(Caspersen et al., 1985; WHO, 2018).

Measuring physical activity: self-reports

- **International Physical Activity Questionnaire (IPAQ)**

- Pros: cheap, short
- Cons: recall bias, inaccurate, imprecise

- **Physical activity logs**

PA logs include checklists of specific activities that are completed at the end of the day or during discreet time periods (e.g., 15 minutes) during the day.

- Pros: cheap, specific types of activities
- Cons: recall bias, time-consuming, high dropout rates, suggestive

- **Physical activity diaries**

Detailed information about activity domains, specific activities, and body positions while performing the activities, self-perceived and/or referenced intensities, and the duration of each PA performed

- specific types of activities, precise
- recall bias, time-consuming, high dropout rates, suggestive

Self-reports: accuracy of recall and reporting bias

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

____ **days per week**

☐ No vigorous physical activities → **Skip to question 3**

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

____ **hours per day**

____ **minutes per day**

☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

____ **days per week**

☐ No moderate physical activities → **Skip to question 5**

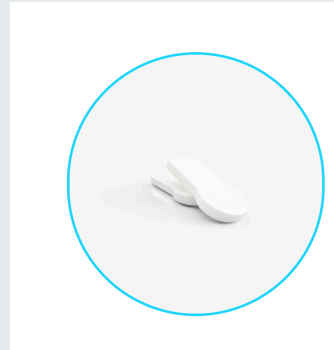
Free-living measurement of physical activity

Fibion (more research is needed) — thigh or pocket worn accelerometer measuring PA based on motion sensors across three axes (great sensitivity, great predictive value, small)

ActiGraph (FDA approved, validated) — a hip or wrist worn accelerometer measuring PA based on motion sensors across three axes (great sensitivity, great predictive value, detects extremely low levels of PA)

ActivPAL (FDA approved, validated) — activity monitor worn on the thigh that uses information about static and dynamic acceleration to 1) distinguish body posture as sitting/lying, standing and stepping and 2) estimate energy expenditure (METs)

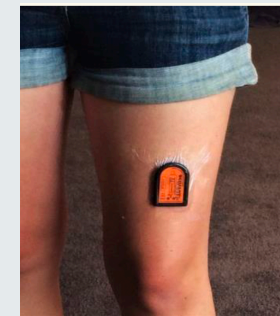
Wrist-worn **consumer-grade** activity tracker's (eg., AppleWatch, Fitbit) sensitivity and predictive value are **not** suitable for research.



Fibion



ActiGraph

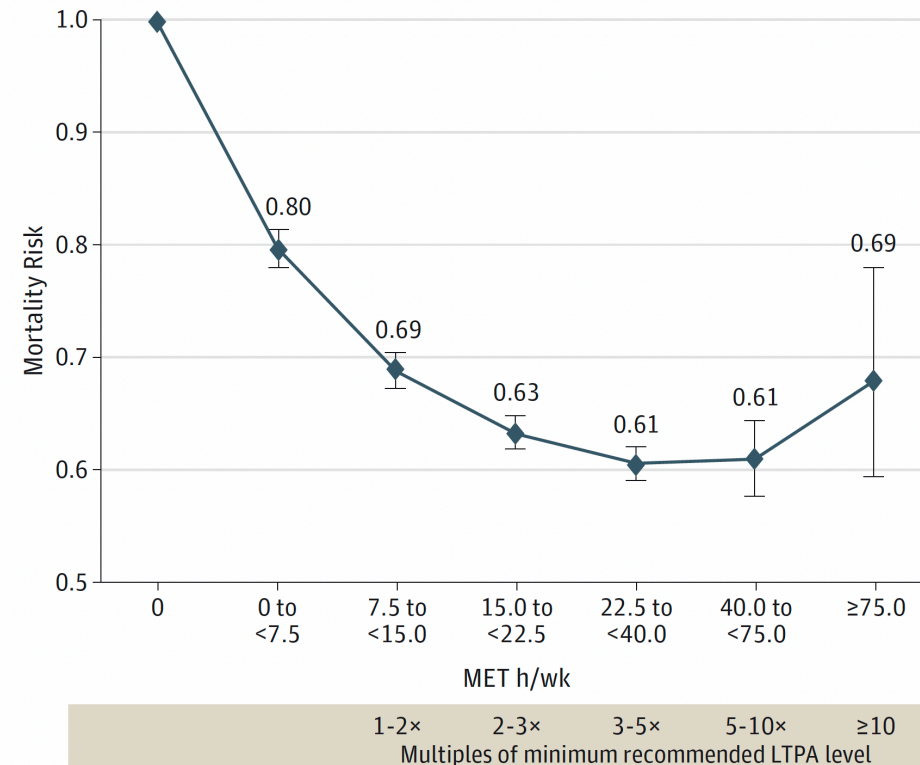


ActivPAL

Lack of physical activity is an independent mortality risk: dose-relationships

- Physical activity is a modifiable independent risk factor for non-communicable diseases such as cardiovascular diseases and metabolic diseases
- In N ~ 270,000 older adults, over 12 years of follow-up, all types of activities associated with lower risks of mortality
- 7.5-15 MET hours per week for racquet sports and running had the lowest all-cause mortality
- Each activity showed a **curvilinear dose-response association with mortality risk**
- Low levels of physical activity were associated with a large reduction in mortality risk, with diminishing returns for each increment in activity thereafter.

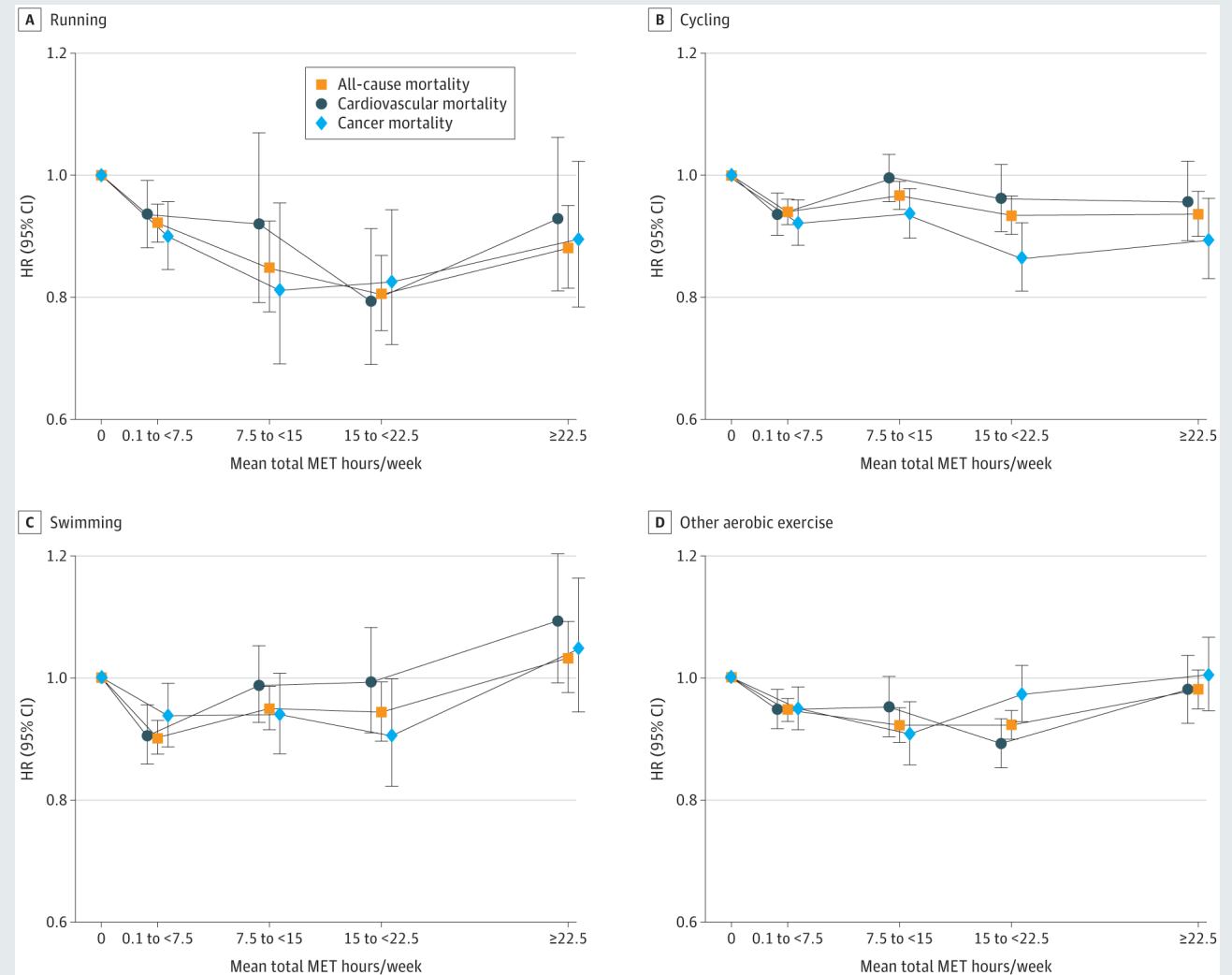
Figure. Hazard Ratios (HRs) and 95% CIs for Leisure Time Moderate- to Vigorous-Intensity Physical Activity and Mortality



JAMA Intern Med 2015 Jun;175(6):959-67. doi: 10.1001/jamainternmed.2015.0533.

Association of Physical Activity Types and Risks Mortality

- Similar trends persist in 2022
- All-cause mortality, cardiovascular mortality and cancer mortality decreases with increased physical activity (MER hours/week)
- Running showed the largest reduction in mortality among different types of physical activity



JAMA Netw Open. 2022;5(8):e2228510. doi:10.1001/jamanetworkopen.2022.28510

Physical activity levels are insufficient world wide

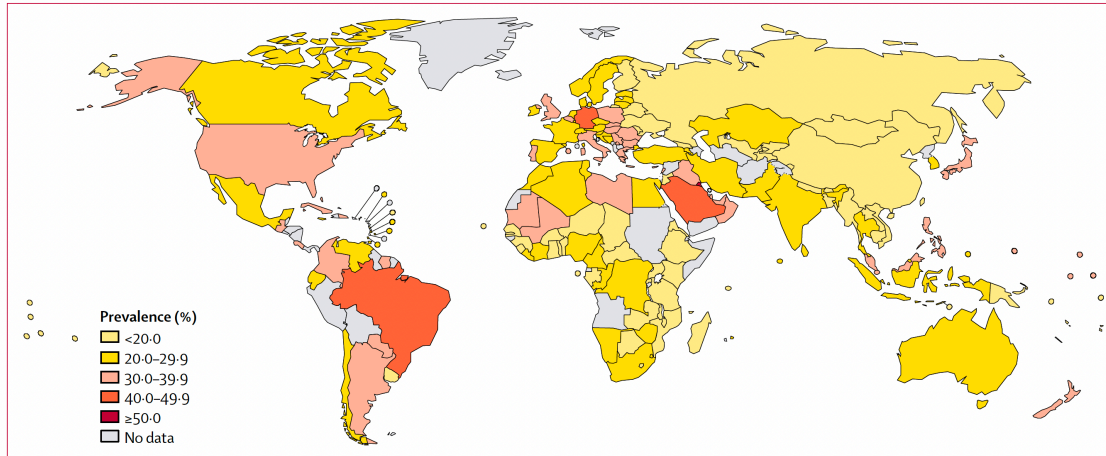


Figure 4: Country prevalence of insufficient physical activity in men in 2016

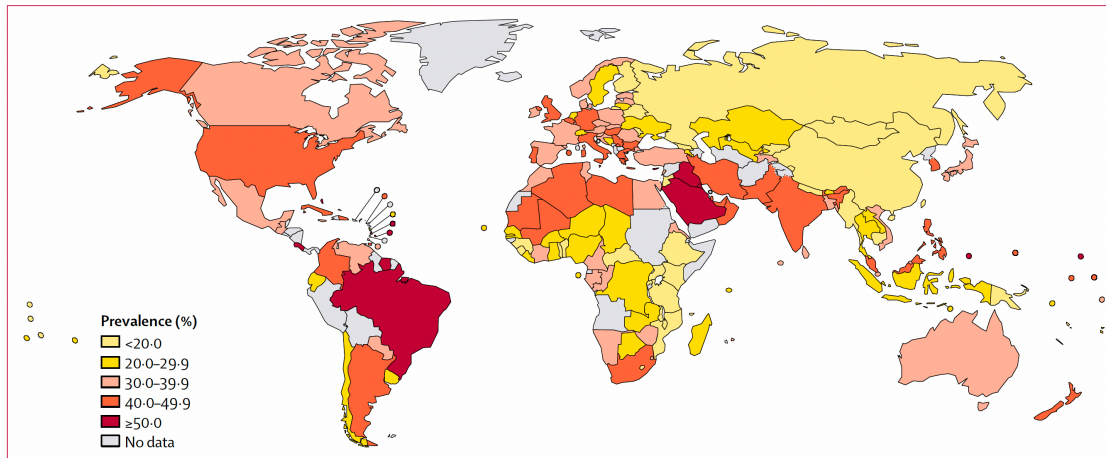


Figure 5: Country prevalence of insufficient physical activity in women in 2016

Lancet Glob Health 2018; 6: e1077–86 Published Online September 4, 2018 [http://dx.doi.org/10.1016/S2214-109X\(18\)30357-](http://dx.doi.org/10.1016/S2214-109X(18)30357-)

168 countries including 1.9 million participants

Global age-standardised prevalence of **insufficient physical activity** was **27.5%** (2016)

Difference between sexes is more than 8 % (23.4% vs in men vs 31.7% in women)

The highest levels of insufficient physical activity:

- Women in Latin America and the Caribbean (43.7%, 42.9–46.5)
- South Asia (43.0%, 29.6–74.9)
- High-income Western countries (42.3%, 39.1–45.4)

Prevalence in 2016 was more than twice as high in high-income countries (36.8%, 35.0–38.0) as in low-income countries (16.2%, 14.2–17.9),

Insufficient physical activity has increased in high-income countries over time (31.6%, 27.1–37.2, in 2001).

Frameworks for understanding physical activity influences

• Social Cognitive Framework

- Physical activity is a result of **social learning**, **mental representations** of motivation, and **perceived ability**
- Individuals form, and subsequently act upon, **expectancies** of behavioural events and outcomes

Examples: Theory of Reasoned Action; Social Cognitive Theory; Health Action Process Approach)

• Humanistic Framework

- Individual action is thought to be motivated by an innate drive to grow, develop, and realise one's potential—a process of **self-actualisation**

Examples: Self-Determination Approach

• Dual Process Models

- Physical activity is governed by **reflective processes** (e.g., intentions, values, expectations), and **automatic processes** such as habits, automatic evaluations, automatic self-schemas, and automatic motivation

Examples: automatic self-schemas and approach/avoidance tendencies

• Socioecological Framework

- Physical activity is the result of direct, indirect and interactive influences from factors of multiple levels that span from the individual to **environment and social policy**

- Providing opportunities to be active / modifying choice architecture to make physical activity more likely / removing opportunities to choose otherwise
- Making physical activity the sensible choice vs making physical activity the only choice

Social Cognitive Theories predicting physical activity

- Individuals will **intend** to be physically active if they believe that (a) physical activity is important, and (b) they are truly capable of enacting activity
- **Rational and value-based approach:** Expectation of capability (self-efficacy) and social encouragement
- A dominant approach to physical activity
- Vast evidence base in support of various social cognitive theories
- **Criticism:**
 - Intention-behaviour gap
 - Past behaviour is the best predictor of behaviour
 - The role of affect on physical activity
 - The overlap among specific theories using this approach
 - No particular social cognitive theory has been more effective in producing physical activity behaviour change than any other
 - Short-lived effects of interventions informed by this theories
 - Over-reliance on the individual as an agent of change
 - The premise that physical activity solely a result of deliberation about values and expectancies is now under debate

Humanistic Framework

- Individuals are active, growth-oriented (**self-actualisation**) organisms who are naturally inclined to form a unified sense of self and to integrate themselves into their larger social structures. Physical activity is enacted if one has sense of choice and control (**autonomy**), **competence**, and promotes sense of connection with others, behaviour is values and relevant (**relatedness**)
- Motivation to engage in physical activity exists on a continuum:
 - **amotivation** (the absence of motivation to exercise)
 - **extrinsic motivation** (engaging in an activity in order to obtain some outcome; eg., increase fitness, decrease frailty)
 - **intrinsic motivation** (performing an activity for its own sake; e.g., exercising because it is enjoyable)
- **Evidence:**
 - Intrinsic motivation was more predictive of long-term exercise adherence (Systematic review)
 - Weak support for the importance of relatedness
- **Criticism:**
 - Inconsistencies in conceptualisation and measurement
 - Self-actualisation is **not** the only influence on the behaviour (eg., operant conditioning, hedonic motivation)

Dual Process Models

- Physical activity is governed by reflective processes (e.g., intentions, values, expectations), and automatic processes (Borland, 2017; Dayan, 2009; Shiffrin & Schneider, 1977; Tversky & Kahneman, 1974)
- Processes and determinants that are not based on explicit cognition and belief (Rebar, Rhodes, & Gardner, 2019; Zhang, Chung, Zhang, & Schüz, 2019)
- **Based on observation that:**
 - humans often engage in behaviour automatically (i.e. without explicit decision-making);
 - past behaviour is the best predictor of behaviour even after accounting for intentions and self-efficacy
- **Relatively new research line**
- **Evidence:**
 - Self-reported habit tends to be associated with physical activity behaviour with medium-to-strong effects automatic (i.e. non-conscious, intuitive, model-free, non-goal directed)
- **Criticism:**
 - Subjective reporting does not capture implicit processes
 - Less understood and less tested factors influencing physical activity

Socioecological Framework

- Physical activity is a function of environment
- Intrapersonal core (e.g., age), interpersonal level (persons and groups), an organisational level (eg., schools) a community level (community, environment structure), and a policy level
- Complementary with individual-level approaches: individuals as actors amidst broader systems ([Sallis, Owen, & Fisher, 2015](#); [Sniehotta et al., 2017](#)).
- Choice architecture to make physical activity more likely (eg., The TIPPME intervention typology for changing environments, Hollands et al. 2017)

Criticism:

- straddle over civil liberties and free choice
- conflict with disability access



Discussion in class

- Numerous interventions targeting physical exercise among 61,293 members were evaluated in RCTs
- 53 experimental conditions (interventions) compared to a Placebo Control condition during a four-week intervention
- Discuss which framework (Social-cognitive; humanistic; dual process, socioecological) best describes the approach informing these interventions. Please provide your reasoning.

3. Exercise Social Norms Shared (High and Increasing)
2. Higher Incentives^a
9. Free Audiobook Provided, Temptation Bundling Explained
6. Planning Fallacy Described and Planning Revision Encouraged
35. Reflecting on Workouts Encouraged
1. Bonus for Returning after Missed Workouts^b
11. Fitness Questionnaire with Decision Support & Cognitive Reappraisal Prompt
5. Bonus for Returning after Missed Workouts^a
13. Asked Questions about Workouts
20. Exercise Social Norms Shared (Low)
12. Values Affirmation
36. Planning Workouts Rewarded
10. Following Workout Plan Encouraged
19. Planning Revision Encouraged
21. Exercise Encouraged with Typed Pledge
26. Values Affirmation Followed by Diagnosis as Gritty
33. Planning Workouts Encouraged
7. Choice of Gain- or Loss-Framed Micro-Incentives
8. Exercise Commitment Contract Explained
42. Exercise Encouraged with E-Signed Pledge
4. Free Audiobook Provided
14. Rigidity Rewarded^a
34. Gym Routine Encouraged
41. Mon-Fri Consistency Rewarded, Sat-Sun Consistency Rewarded
24. Rigidity Rewarded^a
28. Rigidity Rewarded^c
18. Fitness Questionnaire
46. Defaulted into 1 Weekly Workout
17. Exercise Advice Solicited
25. Exercise Encouraged with Signed Pledge
39. Reflecting on Workouts Rewarded
22. Gain-Framed Micro-Incentives
30. Planning, Reminders & Micro-Incentives to Exercise

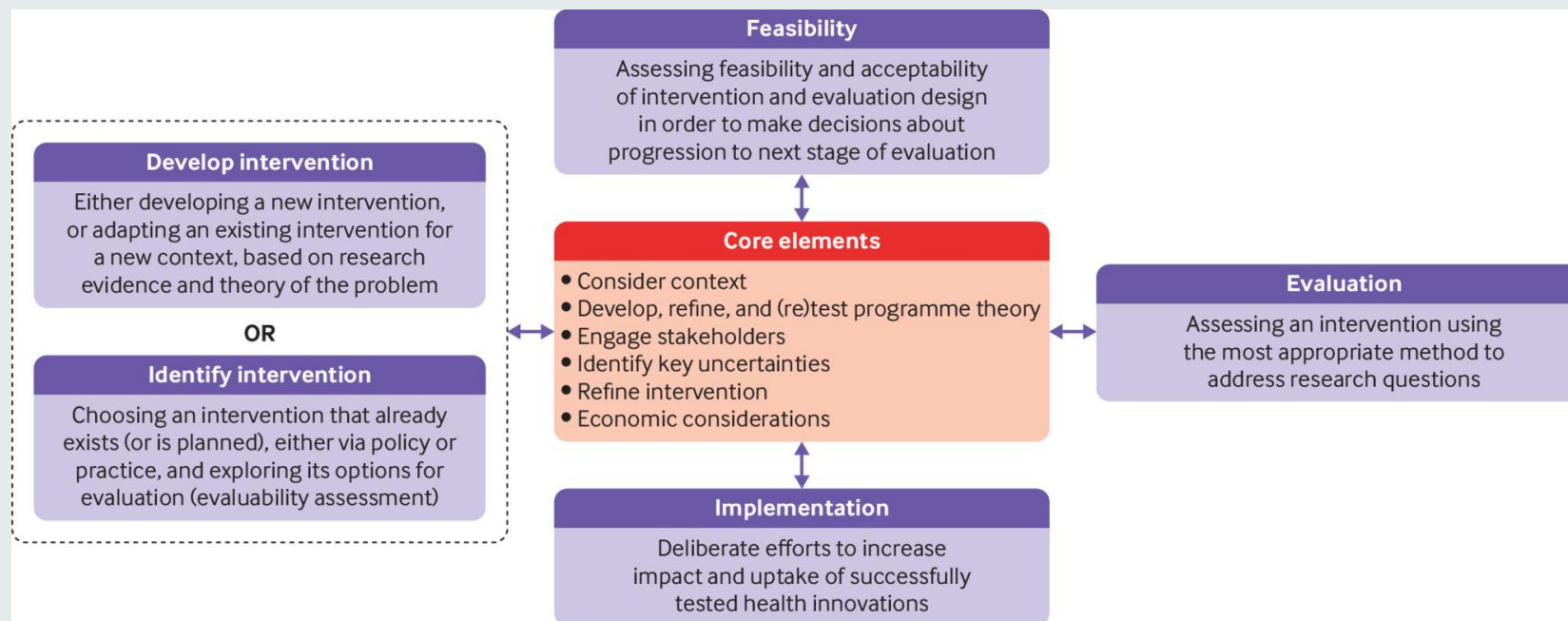
Discussion in class

- QR code for the list of interventions:



Methods used to develop physical activity interventions

- Physical activity is a complex behaviour
- Factors influencing physical activity for the particular context and population group should be systematically identified



Medical Research Council guidelines for developing complex interventions (Skivington et al., 2021)

Methods used to develop physical activity interventions

- Developing behaviour change interventions for self-management in Chronic Illness (Araújo-Soares et al., 2019)
- Collection of social-cognitive models and intervention development informed by these models (Hagger, Hamilton & Lintunen, 2020)
- An intervention mapping approach (Kok et al., 2016)
- Behaviour Change Wheel (Michie, Van Stralen, West, 2011)

Methods used to evaluate physical activity interventions

- Meta-analysis of RCTs: efficacy
- Mixed-methods studies of acceptability and fidelity
- What about the uncertainty in the evidence?

Discussion in class

Critically appraise public campaigns developed to promote physical activity

- watch 1-minute video: <https://www.thisgirlcan.co.uk/>
 - Who are the target group of the campaign?
 - What are the assumed barriers to physical activity?
 - What about enabling factors?
 - How would you go about evaluating this campaign?

Discussion in class

- Join the movement campaign: <https://www.sportengland.org/jointhemovement>
 - Who are the target group of the campaign?
 - What are the assumed barriers to physical activity?
 - What about enabling factors?
 - How would you go about evaluating this campaign?

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