Behavior change and physical activity maintenance in children – Fun or what?

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WHO GUIDELINES ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

At least 60 minutes a day

moderate- to vigorous-intensity physical activity across the week; most of this physical activity should be aerobic.

On at least 3 days a week

vigorous-intensity aerobic activities, as well as those that **strengthen muscle and bone** should be incorporated.

LIMIT

the amount of time spent being sedentary, particularly recreational screen time.

Children have not gotten the memo yet…

Indicator	All countries (N = 57)	Very high HDI (n = 42)	High HDI (n = 11)	Medium/low HDI (n = 4)
Overall Physical Activity	D	D+	D	D+
Organized Sport and Physical activity	C-	C	D	C
Active Play	C-	C-	D-	C+
Active Transportation	C-	C-	C-	C+
Sedentary Behavior	D+	D	D+	C-
Physical Fitness	C-	C	D+	INC

Journal of Physical Activity and Health, 2022, 19, 700-728
https://doi.org/10.1123/jpah.2022-0456

Human Kinetics
ORIGINAL RESEARCH

Global Matrix 4.0 Physical Activity Report Card Grades for Children and Adolescents: Results and Analyses From 57 Countries

What about Finnish children?

Table 1 Grades and rat… Finland's 2018 Report Card

Indicator	Grade	2022	
Overall Physical Activity (PA)	D	A-	rtion of children and adolescent who meet the minimum recommendation of engaging in at least s of PA a day. 34% of 9-15 y (LIITU objective measurements, 2016), 31% of 9-15 y (LIITU survey % of 10-11 y and 19% of 14-15 y (School Health Promotion (SHP) Study 2017).[2]
Organized Sport Participation	C+	C+	rtion of children and youth who participate in sports club activities or other organized physical activities. 15 y participate in sports club activities (LIITU survey 2016). 53% of 9-15 y participate in sports club t least once per week (LIITU survey 2016).[1] 48% of 14-15 y participate in organized physical activities ealth Promotion (SHP) Study 2017).[2]
Active Play	C	C-	rtion of children and youth who engage in unorganized active play at least 4 times per week. 51% of 9- ipate in unorganized PA at least 4 times per week (LIITU survey 2016).[1] 41% of 14-15 y participate in d physical activity or sports almost daily (School Health Promotion (SHP) Study 2017).[2]
Active Transportation	B+	B+	rtion of children and adolescent who actively commute to school, on foot or by bike (among those who an 5 km away from school). Total 77% of 9-15 y (80% of 9 y, 83% of 11 y, 79% of 13 y, 61% of 15 y, vey 2016).[1]
Sedentary Behaviours	D-	INC	rtion of children and adolescent who meet recommendations related to screen time (maximum of two at least 5 days per week 25% of 9-15 y (LIITU survey 2016).[1]
Physical Fitness	C	C-	rcentile achieved: BOYS C- (44% of 11 and 14 y, 46% of 11 y, 41% of 14 y), GIRLS C+ (59% of 11 and of 11 y, 69% of 14 y) reached by using VO2peak (Median values used instead of mean values). (National nitoring system for physical functioning capacity 2017).[3]
Family and Peers	B-	B-	rtion of children and adolescents with family members or peers who encourage and support them to be active or are physically active with them. The percentage of 9-15 y report that at least one parent: encourages them to be physically active (80%), contributes financially to their children's physical activities (79%), takes them to venues of physical activities (64%), is physically active with their children (38%). (LIITU survey 2016).[1] 43% of 9-15 y note that their friends are physically active with them (LIITU survey 2016).[1]

This looks bad.

Kids will probably grow out of it though, right?

Children seem to grow **into** inactive lifestyles

- Annual declines in MVPA:
  - 3.4% in boys
  - 5.3% in girls
- Largest reduction in MVPA at age 9

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DOI: 10.1111/obr.12953

PEDIATRIC OBESITY/BEHAVIOR

OBESITY Reviews WILEY

Longitudinal changes in moderate-to-vigorous-intensity physical activity in children and adolescents: A systematic review and meta-analysis

Abdulaziz Farooq[1,3] | Anne Martin[2] | Xanne Janssen[3] | Mathew G. Wilson[1,4] | Ann-Marie Gibson[3] | Adrienne Hughes[3] | John J. Reilly[3]

And tend to stay there

- Inactivity among young people seems to persist quite strongly into later ages

Distinct trajectories of physical activity and related factors during the life course in the general population: a systematic review

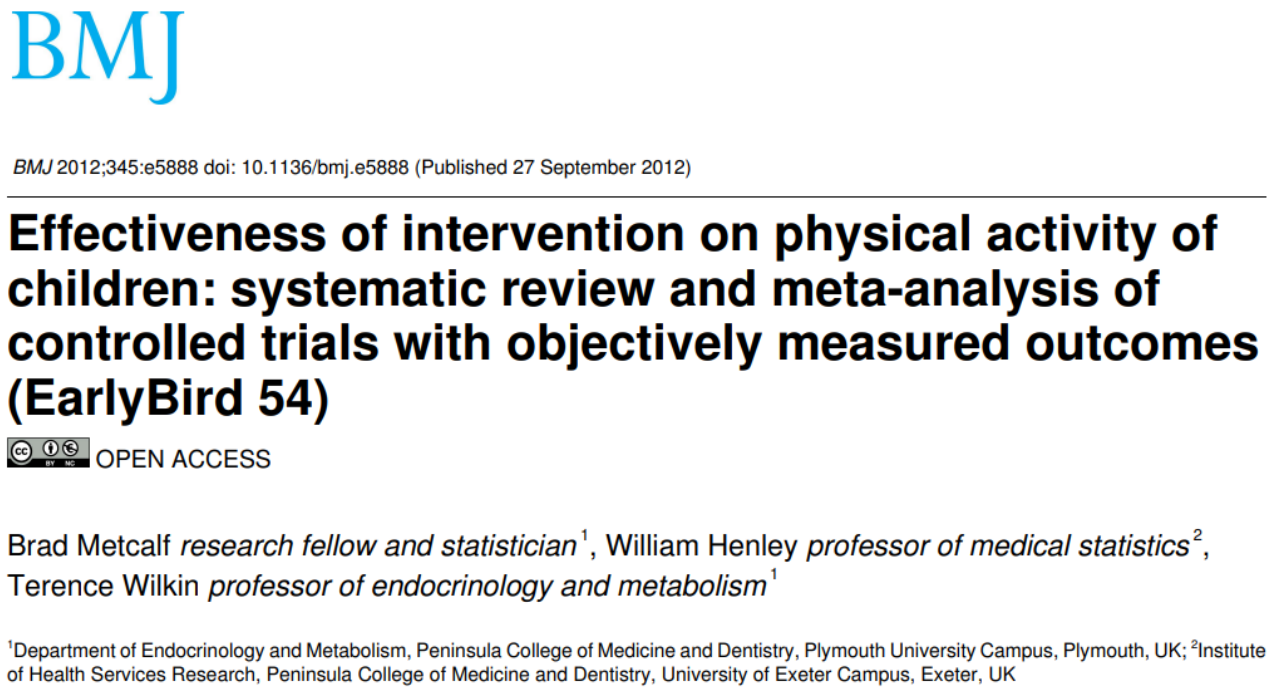
Irinja Lounassalo ✉, Kasper Salin, Anna Kankaanpää, Mirja Hirvensalo, Sanna Palomäki, Asko Tolvanen, Xiaolin Yang & Tuija H. Tammelin

BMC Public Health **19**, Article number: 271 (2019) | Cite this article

Right…
We need an intervention for our kids!

Many PA interventions, but not effective

- k=30
- Total PA: *small to negligible effects* (SMD: 0.12)
- Moderate or vigorous PA: *small effects* (SMD 0.16)
- Equates to <4 minutes difference per day.



BMJ

BMJ 2012;345:e5888 doi: 10.1136/bmj.e5888 (Published 27 September 2012)

Effectiveness of intervention on physical activity of children: systematic review and meta-analysis of controlled trials with objectively measured outcomes (EarlyBird 54)

Brad Metcalf *research fellow and statistician*[1], William Henley *professor of medical statistics*[2], Terence Wilkin *professor of endocrinology and metabolism*[1]

[1]Department of Endocrinology and Metabolism, Peninsula College of Medicine and Dentistry, Plymouth University Campus, Plymouth, UK; [2]Institute of Health Services Research, Peninsula College of Medicine and Dentistry, University of Exeter Campus, Exeter, UK

What about school-based PA interventions?

- Null effects on objective PA.

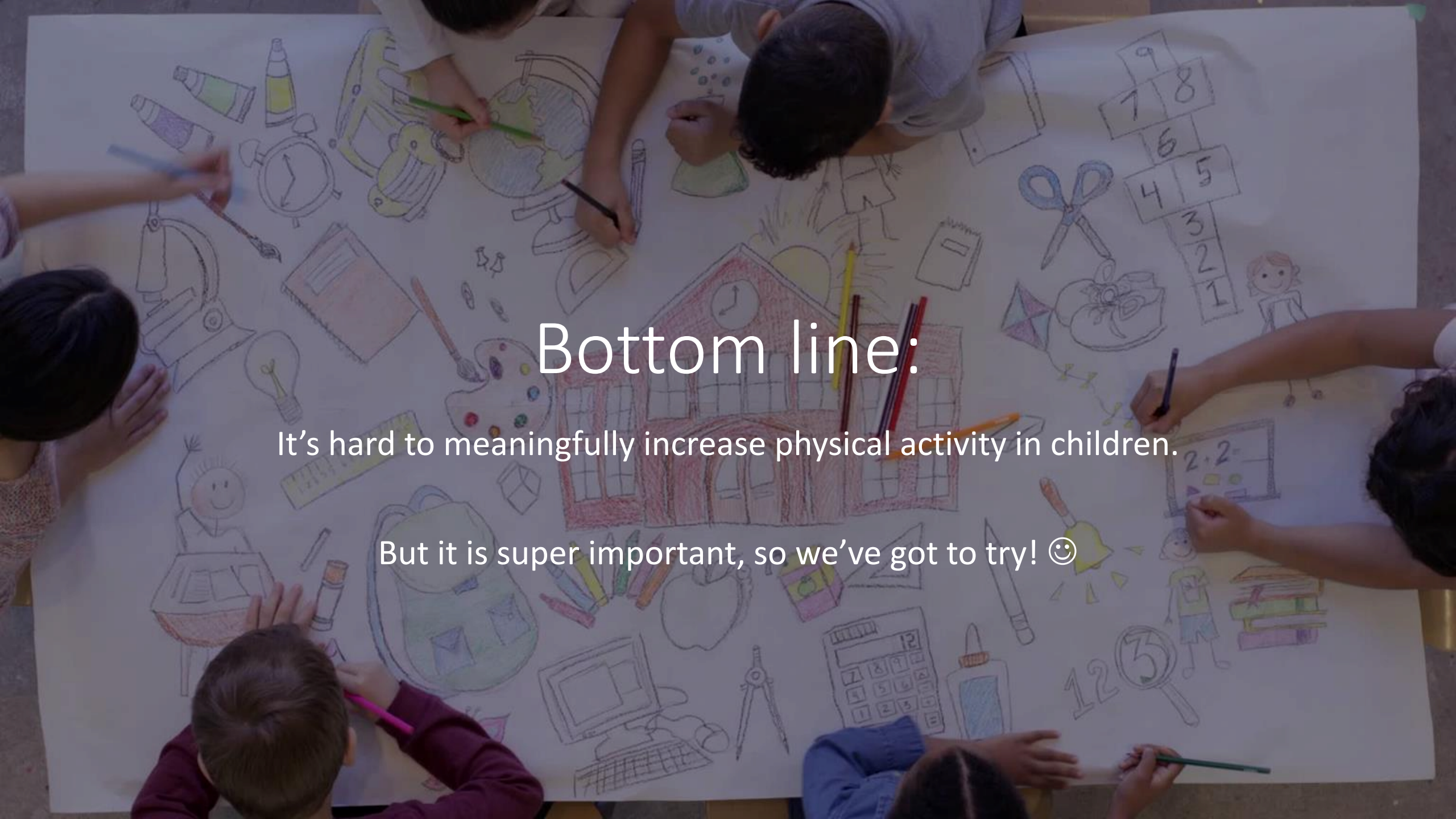
Received: 22 August 2018 | Revised: 26 October 2018 | Accepted: 21 November 2018
DOI: 10.1111/obr.12823

PEDIATRIC OBESITY/OBESITY PREVENTION

WILEY obesityreviews

Are school-based physical activity interventions effective and equitable? A meta-analysis of cluster randomized controlled trials with accelerometer-assessed activity

Rebecca Love | Jean Adams | Esther M. F. van Sluijs



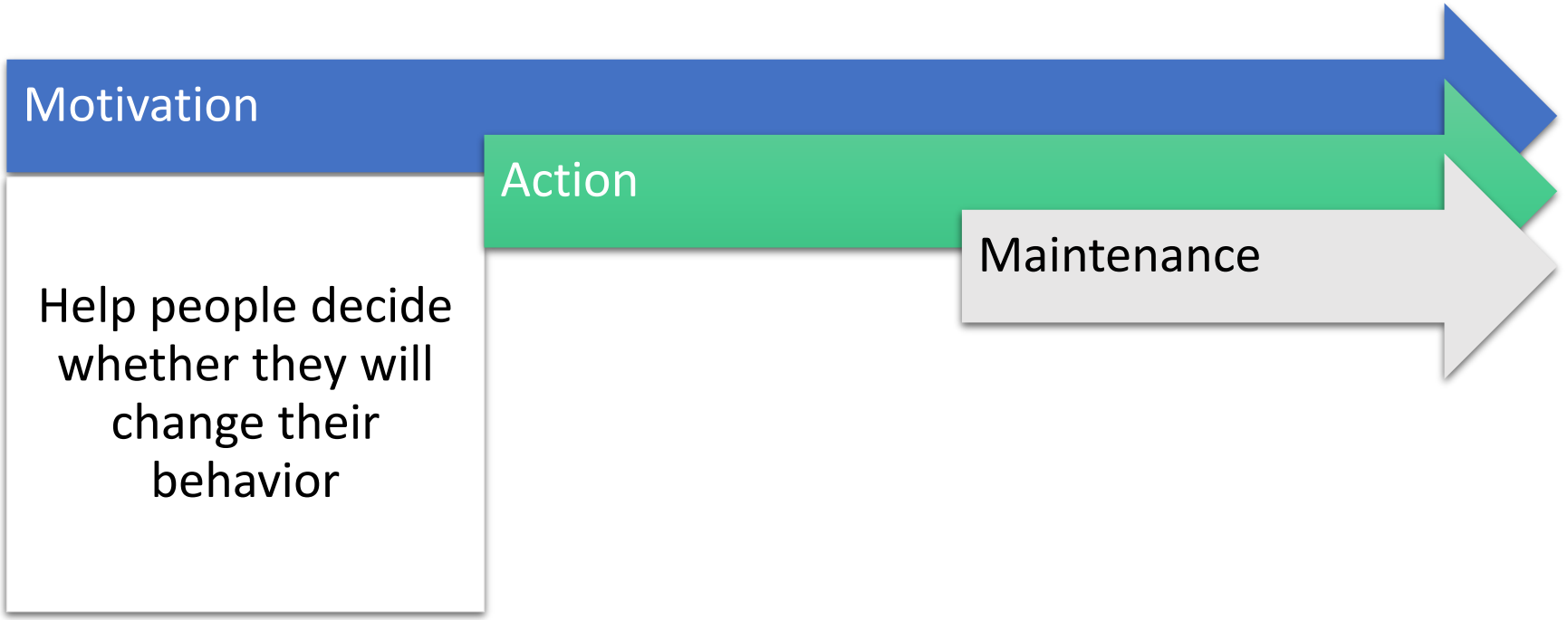
Bottom line:

It’s hard to meaningfully increase physical activity in children.

But it is super important, so we’ve got to try! ☺

So, what can we do?

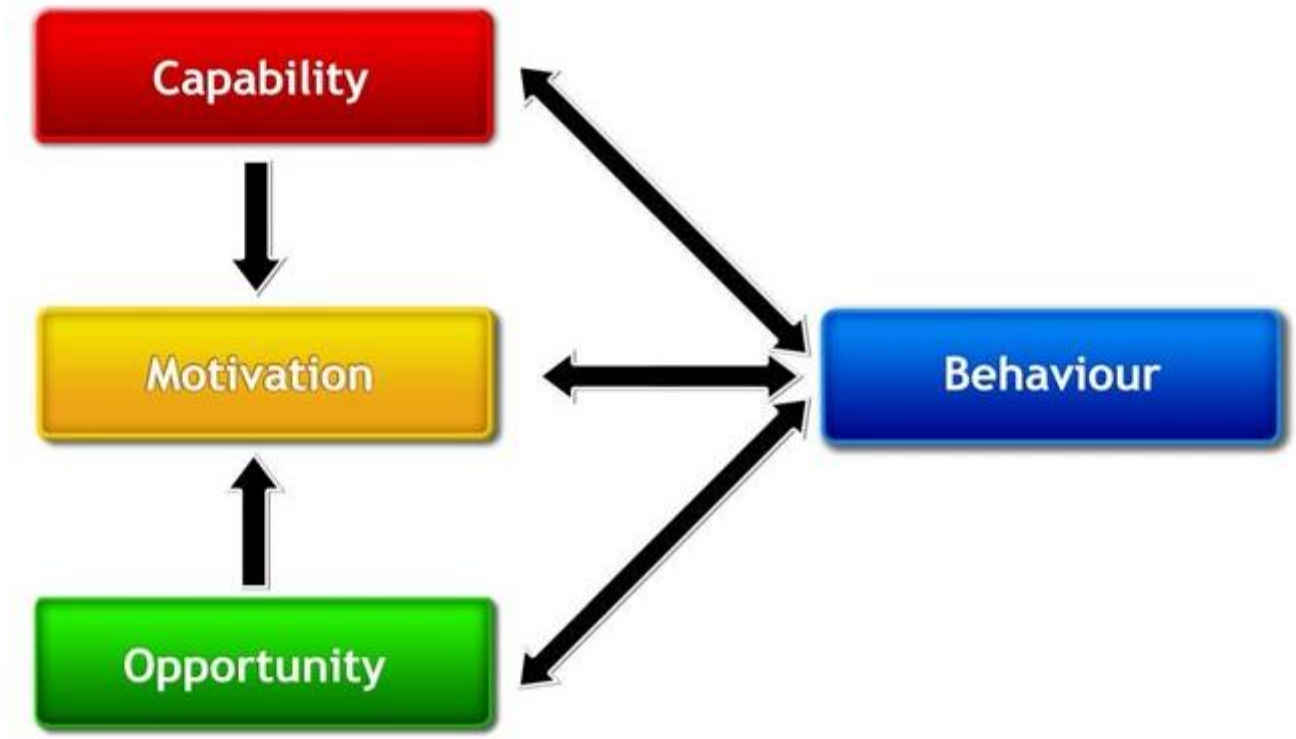
Behavior change is a process



COM-B Model

Psychological

Physical

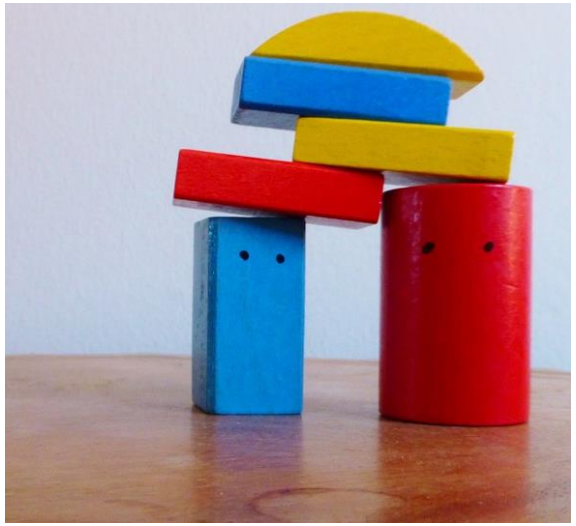


Michie et al (2011) Implementation Science

Psychological Capability

- Self-efficacy
  - Belief in own ability to undertake a behavior
- Perceived control
  - Belief in own control ever whether behavior takes place

Building self-efficacy



- Positive (past) experiences
  - Small, achievable tasks with feedback
- Observing positive experiences of similar others
  - Identifying role models
- Persuasion
  - Or self-persuasion?

Ashford, Edmunds & French, 2010; Bandura, 1982

Physical Capability

- People have limitations and preferences
- The key is to find matches between preferences, ability and desired outcomes
- This requires clinical knowledge, creativity, effort and an open mind!
  - Guess and test

COM-B Model

Michie et al (2011) Implementation Science

Physical/Environmental Opportunity

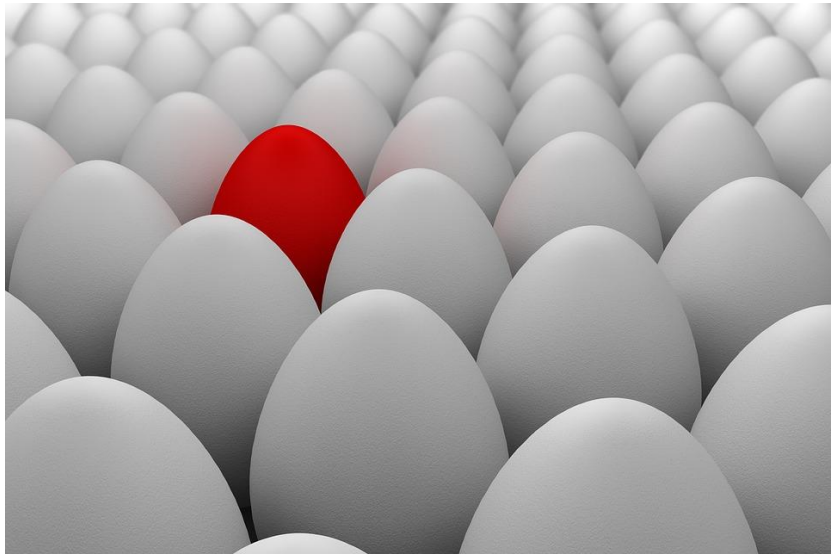
Inequality in the Built Environment Underlies Key Health Disparities in Physical Activity and Obesity

Penny Gordon-Larsen, PhD[a], Melissa C. Nelson, PhD, RD[b], Phil Page, MA[c], Barry M. Popkin, PhD[a]

- Parks, sports clubs, nature areas, exercise equipment, etc.
- Helping people to locate opportunities and obtain access is important.

Social Opportunity

- New behavior has to be seen as ‘normal’
- Social (un)acceptance very important determinant of behavior



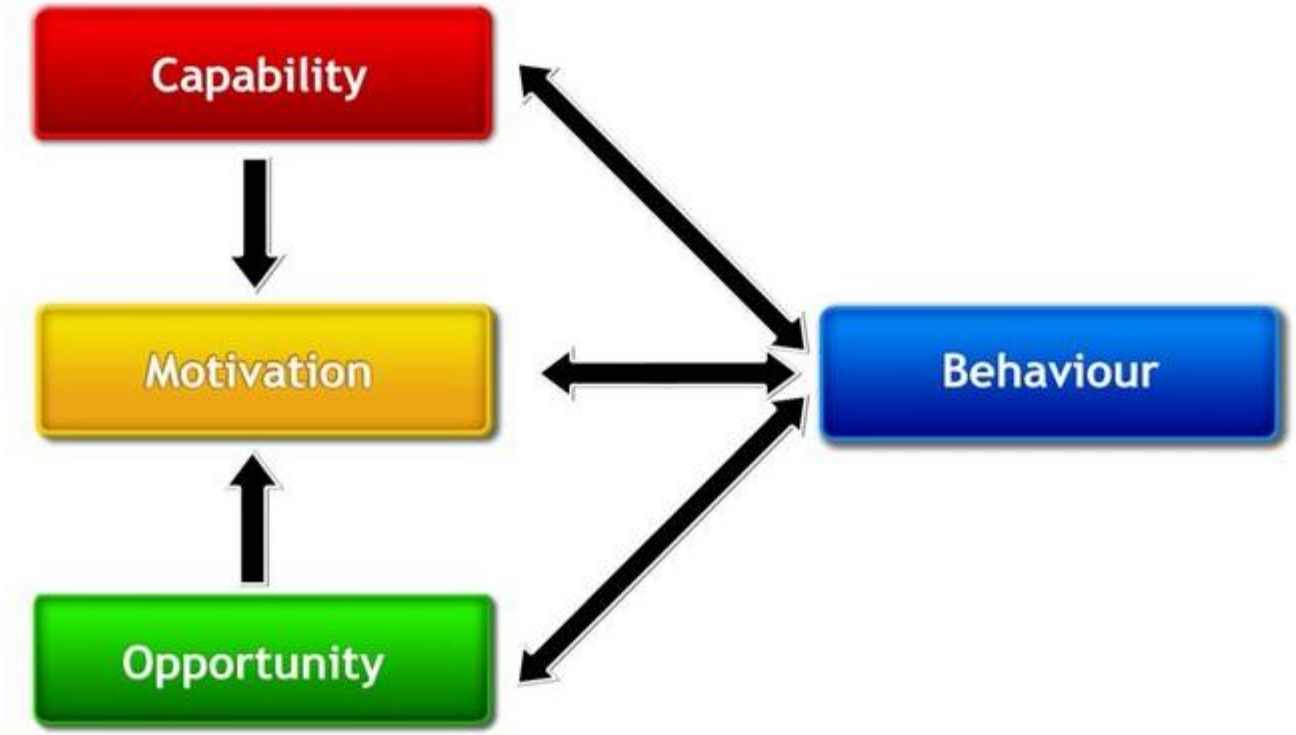
COM-B Model

Beliefs about what is good and bad, conscious intentions, decisions and plans

Reflective

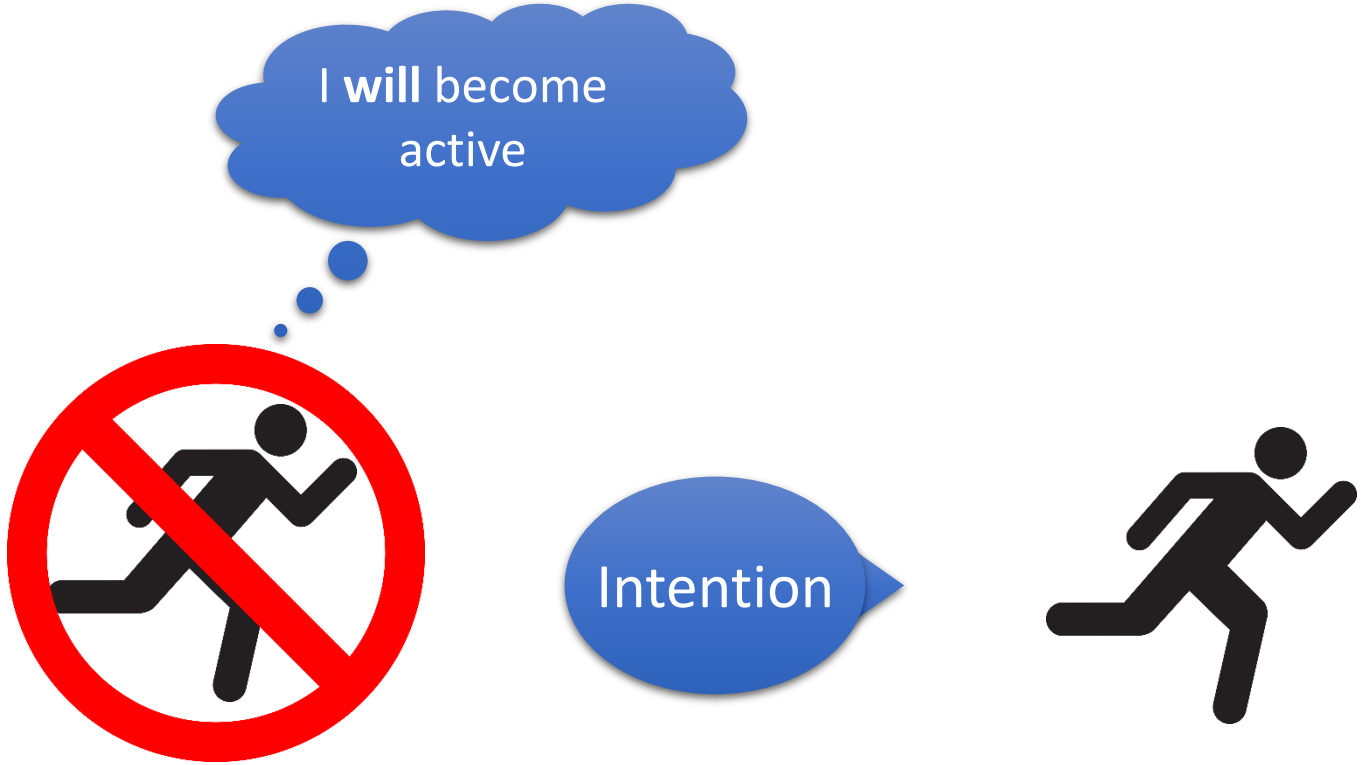
Automatic

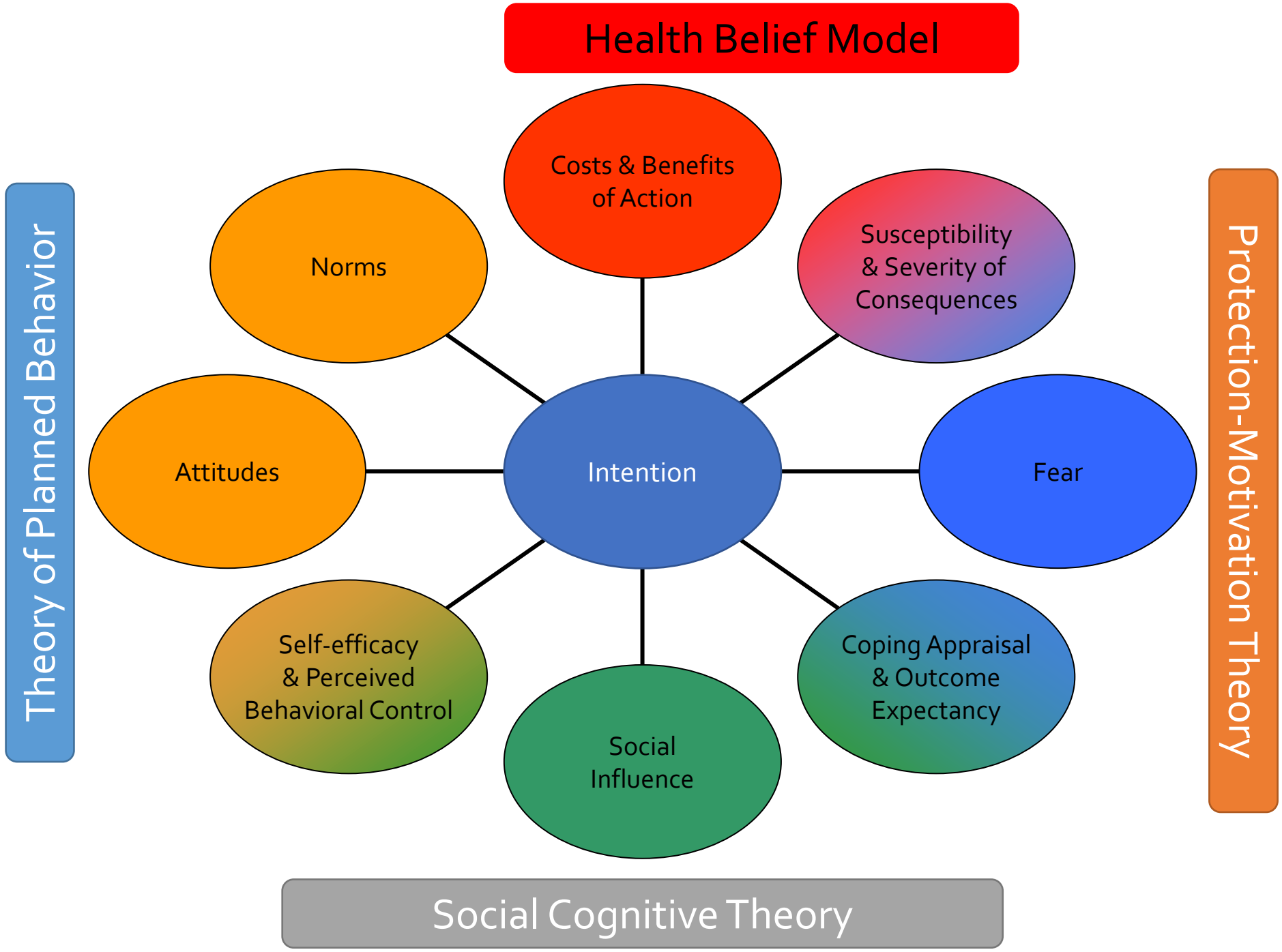
Emotional responses, desires, impulses and habits resulting from associative learning and physiological states



Michie et al (2011) Implementation Science

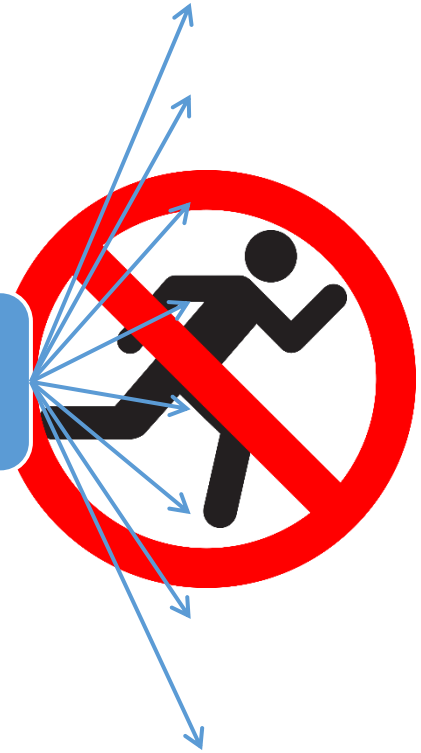
Motivation - From A to B…




Health Belief Model
Costs & Benefits of Action
Norms
Susceptibility & Severity of Consequences
Attitudes
Intention
Fear
Self-efficacy & Perceived Behavioral Control
Social Influence
Coping Appraisal & Outcome Expectancy
Theory of Planned Behavior
Protection-Motivation Theory
Social Cognitive Theory

Behavior change interventions

Behavior Change Techniques



- Self-Efficacy
- Social Influences
- Outcome Expectancies
- Norms
- Attitudes
- Fear
- Severity of consequences
- Costs & Benefits

I **will** become active

Intention → Behavior

Stages of change

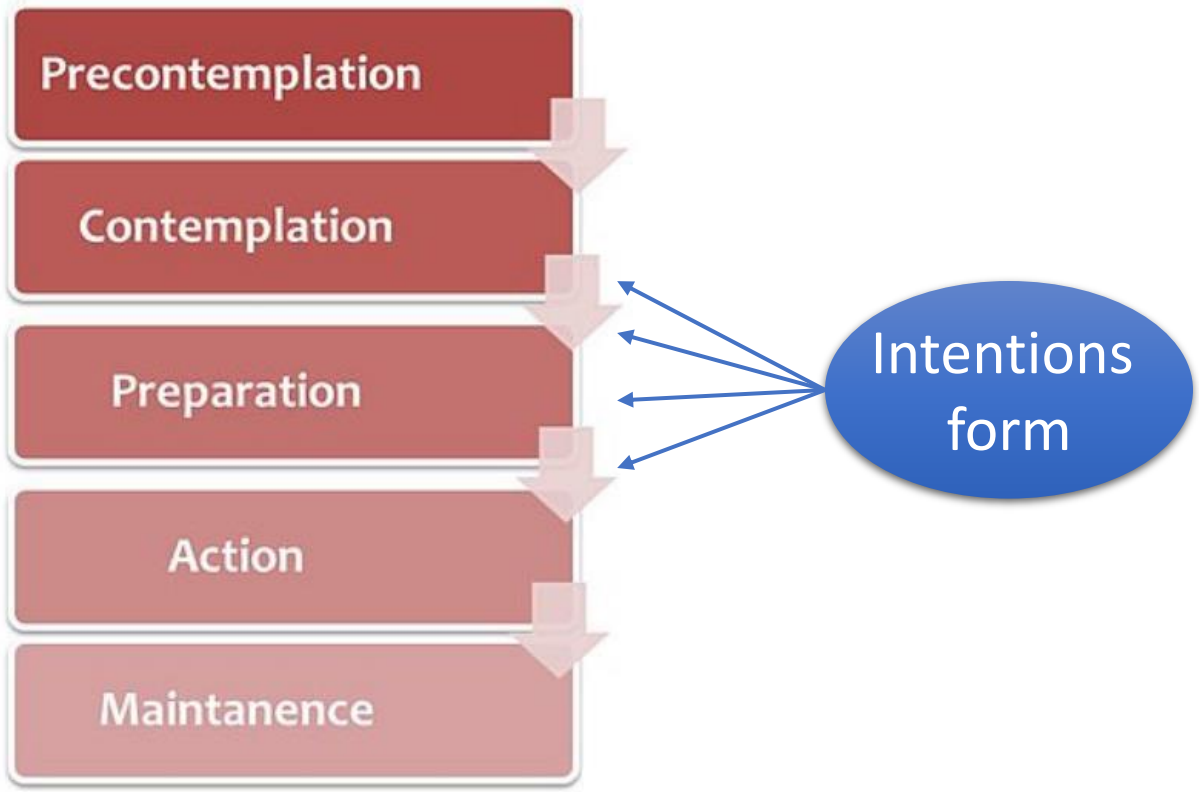
I have not considered…

I have considered…

I have decided to…

I have…

I have continued to…



Transtheoretical Model; Prochaska & DiClemente, 1983

Meta-analysis

- Which Behavior Change Techniques are associated with changes in
  - Intention?
  - Stage of change?
  - Autonomous motivation?

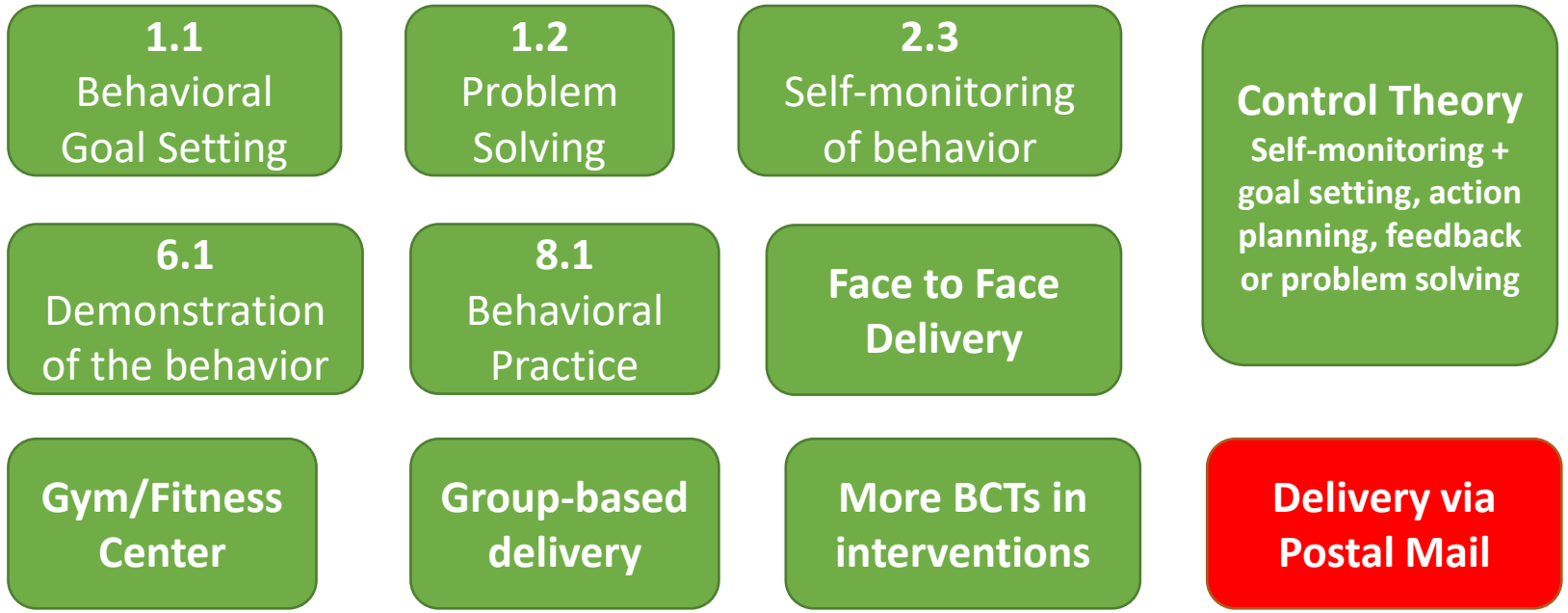
HEALTH PSYCHOLOGY REVIEW, 2018
https://doi.org/10.1080/17437199.2018.1435299

How can interventions increase motivation for physical activity? A systematic review and meta-analysis

Keegan Knittle [a], Johanna Nurmi [a,b], Rik Crutzen [c], Nelli Hankonen [a,d], Marguerite Beattie [a] and Stephan U Dombrowski [e]

[a]Department of Social Research – Social Psychology, University of Helsinki, Helsinki, Finland; [b]Behavioural Science Group, Institute of Public Health, University of Cambridge, Cambridge, UK; [c]Department of Health Promotion, Maastricht University/CAPHRI, Maastricht, Netherlands; [d]Faculty of Social Sciences, University of Tampere/Linna, Tampere, Finland; [e]Faculty of Natural Sciences, Division of Psychology, University of Stirling, Stirling, UK

Intervention features associated with increases in motivation for PA across 89 studies:



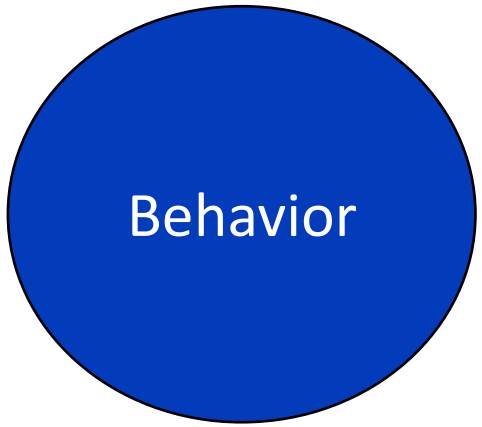
COM-B Model

Michie et al (2011) Implementation Science

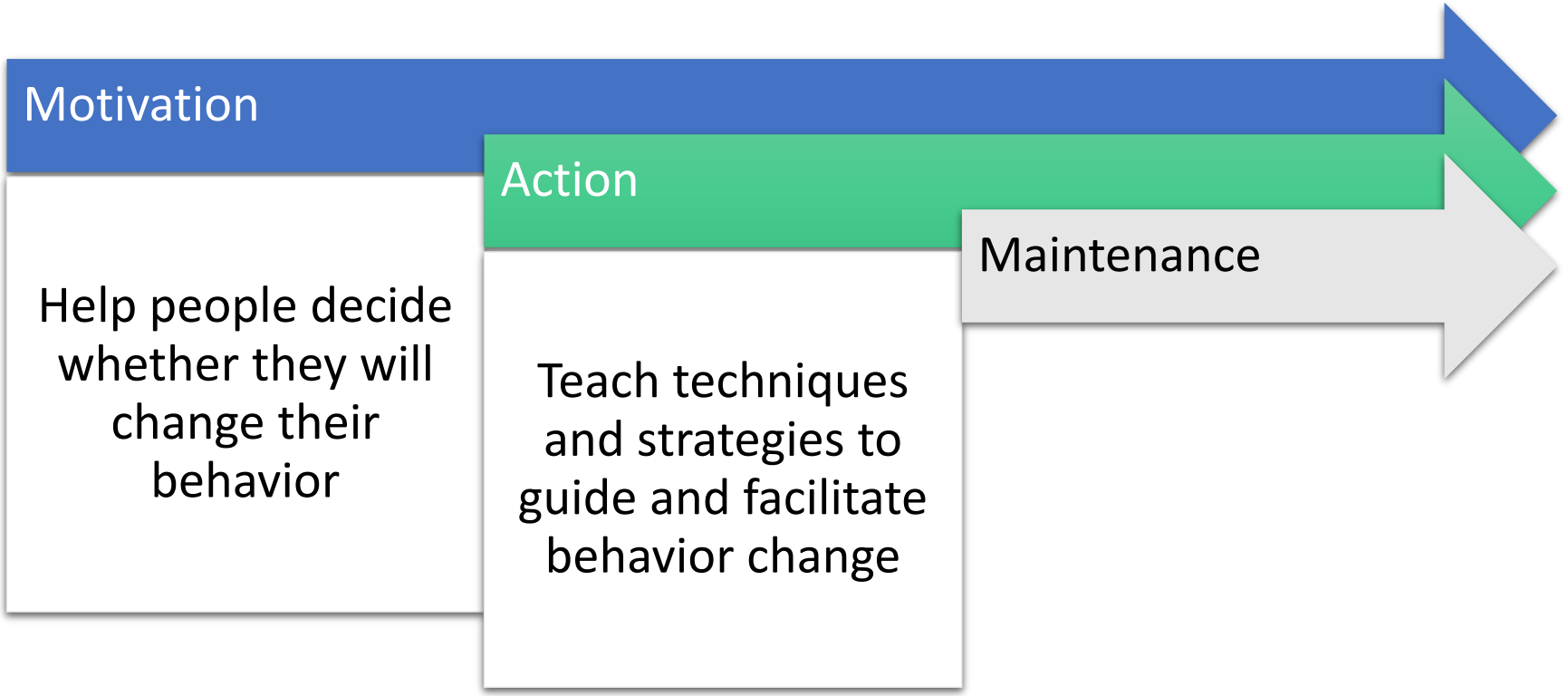
Intention/Motivation ≠ Behavior

- Intention explains only about 40% of behavior

- Bridging this intention-behavior gap requires self-regulatory effort



Behavior change is a process

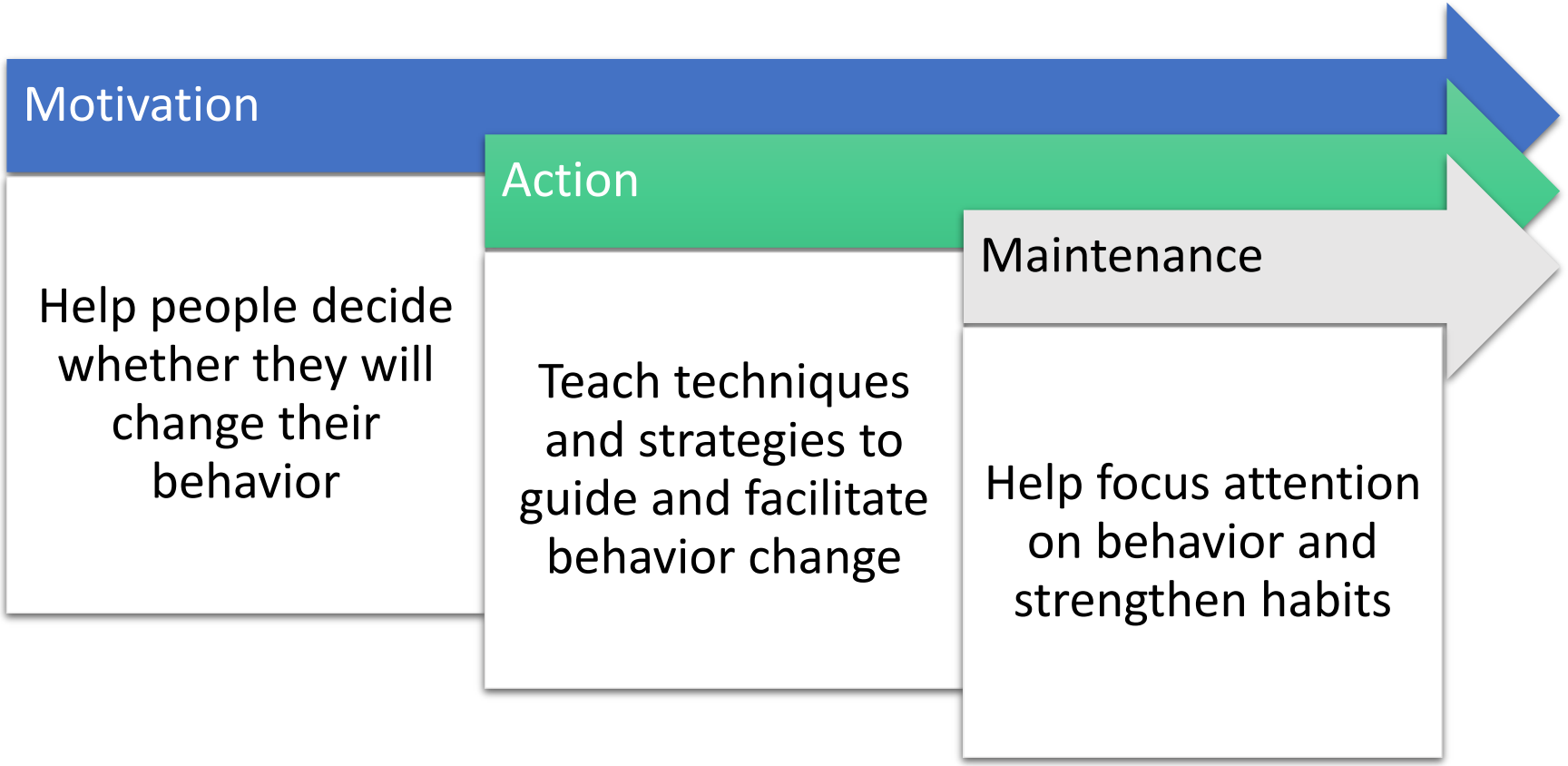


Self-Regulation Techniques

- Strong evidence for effectiveness
  - Improving PA and other health behaviors
  - Reducing depressive symptoms
- Takes cognitive resources
  - Too demanding to do continuously

Control Theory
Self-monitoring, goal setting, action planning, feedback and problem solving

Behavior change is a process



Theories of Maintenance

HEALTH PSYCHOLOGY REVIEW, 2016
VOL. 10, NO. 3, 277–296
http://dx.doi.org/10.1080/17437199.2016.1151372

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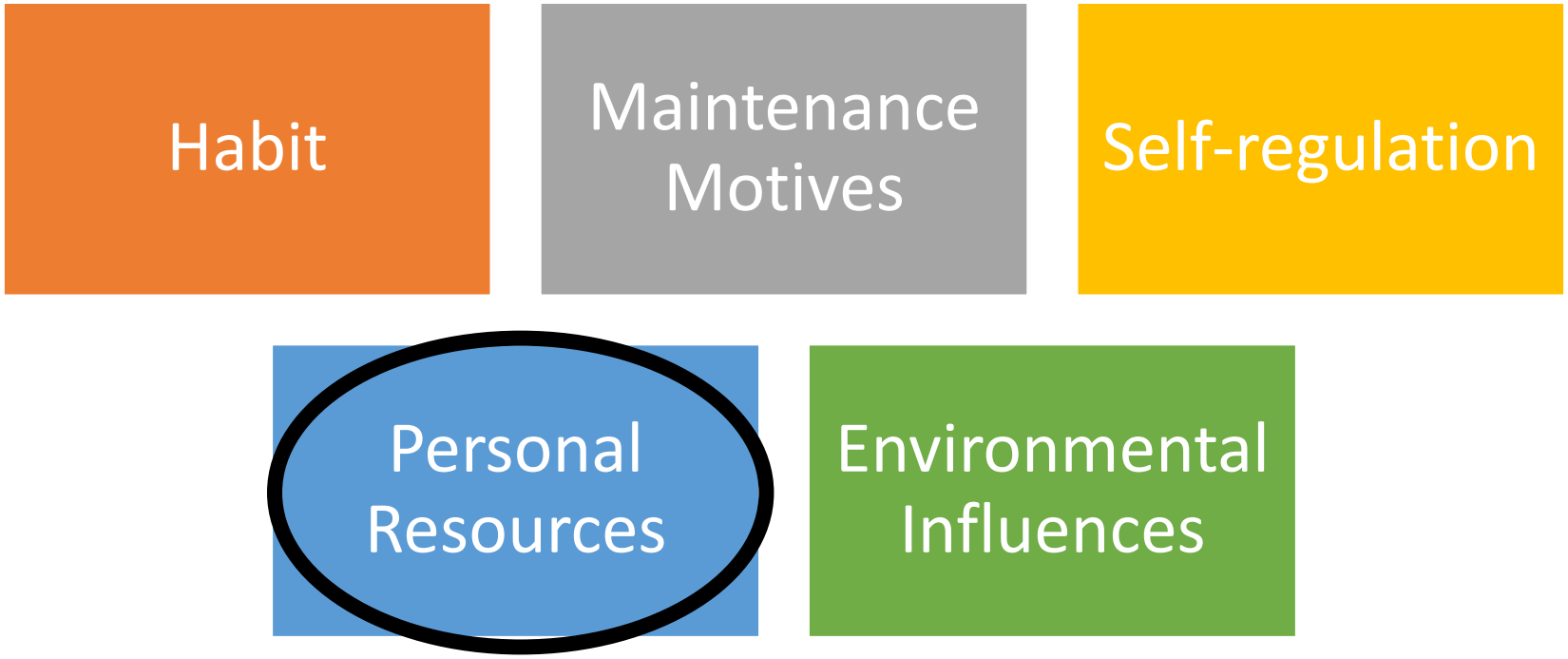
REVIEW

OPEN ACCESS

Theoretical explanations for maintenance of behaviour change: a systematic review of behaviour theories

Dominika Kwasnicka[a,b], Stephan U Dombrowski[c], Martin White[d] and Falko Sniehotta[a,b]

- Key theoretical domains of behavioral maintenance:



Personal Resources

- Pain, fatigue, mood and lack of time are all common barriers to PA

- Barriers slow down habit formation

- Some people need help in
  - Identifying their own barriers
  - Having clear plans of how to cope with these

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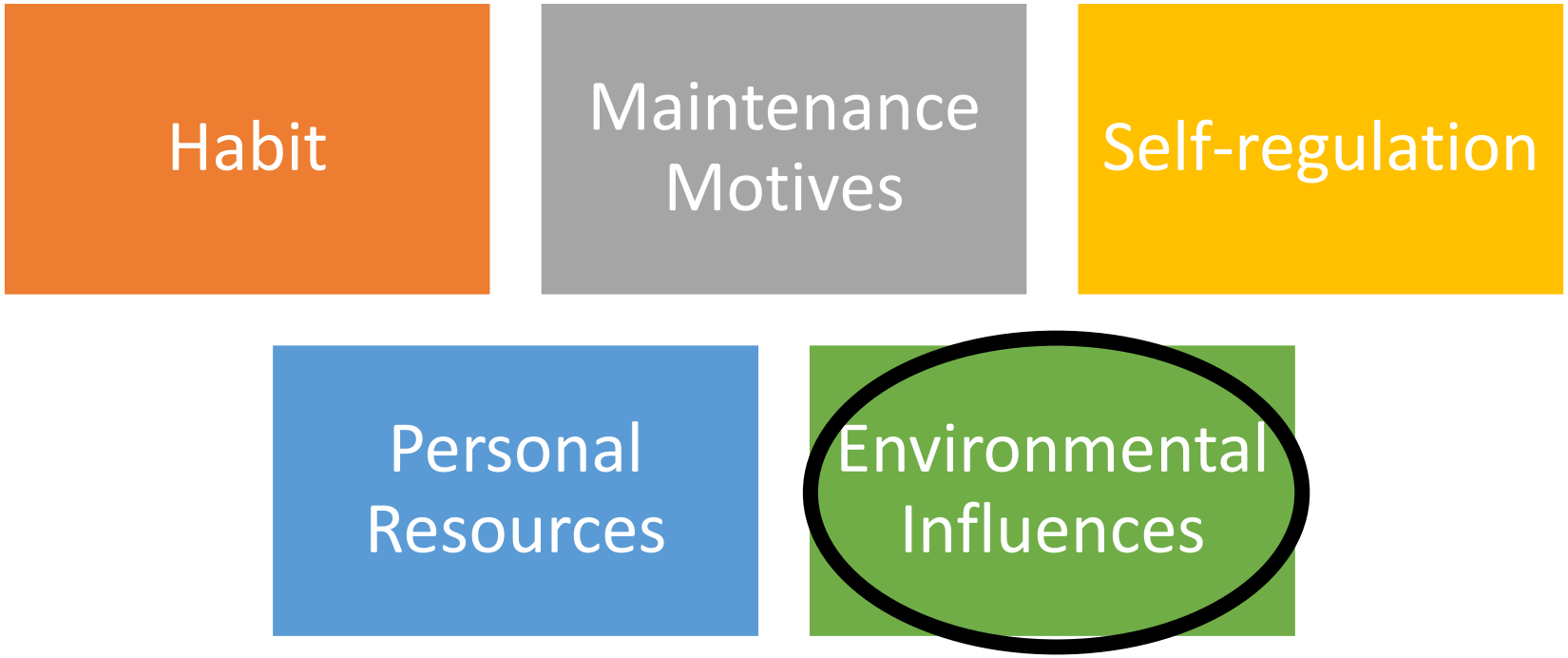


Environments

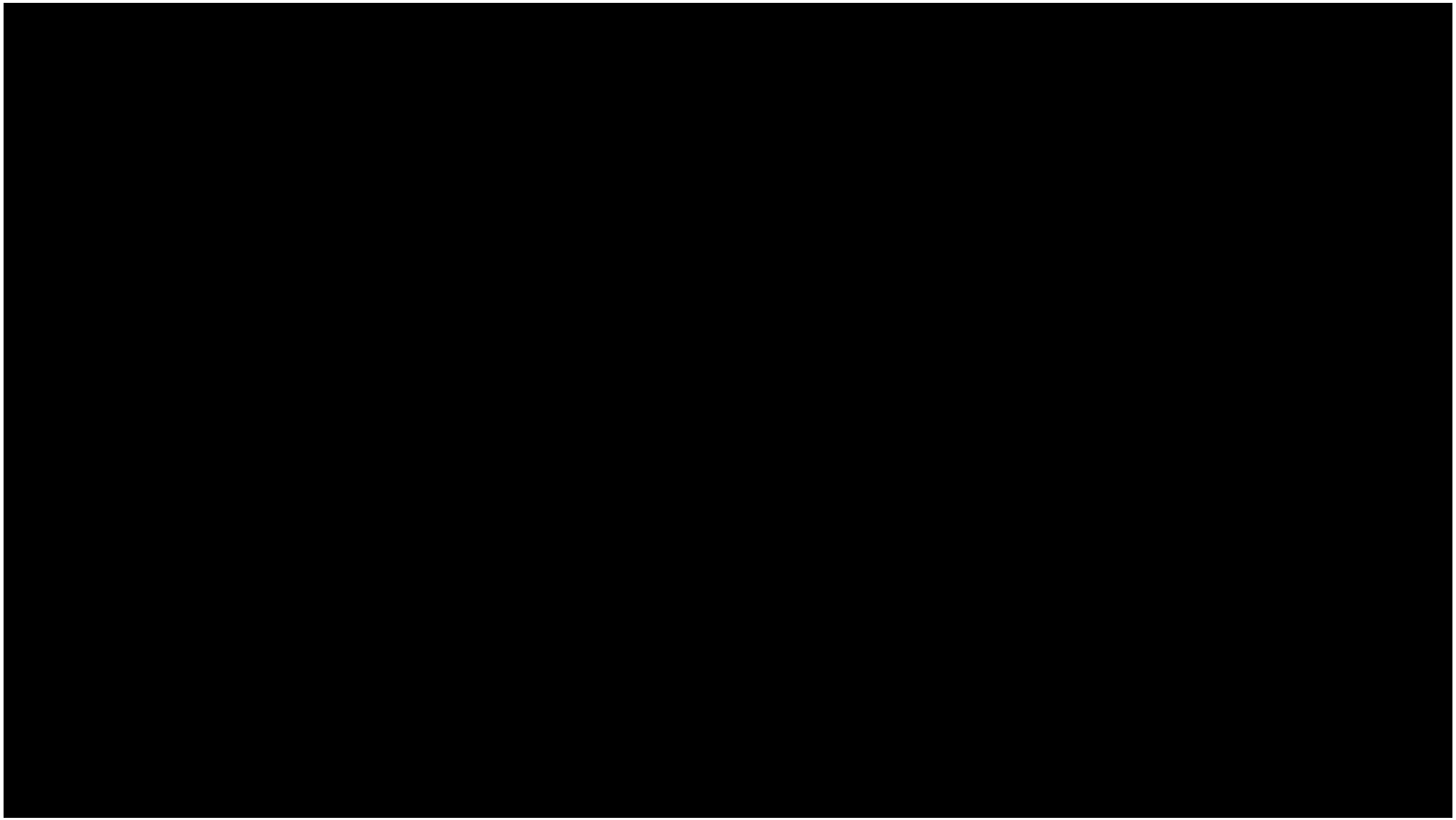
- Physical environments: parks, sports clubs, nature areas, gyms, exercise equipment, supervised exercise

Inequality in the Built Environment Underlies Key Health Disparities in Physical Activity and Obesity

Penny Gordon-Larsen, PhD[a], Melissa C. Nelson, PhD, RD[b], Phil Page, MA[c], Barry M. Popkin, PhD[a]

- Social environments:
  - Social support
  - PA opportunities that foster a sense of belonging

Nudging



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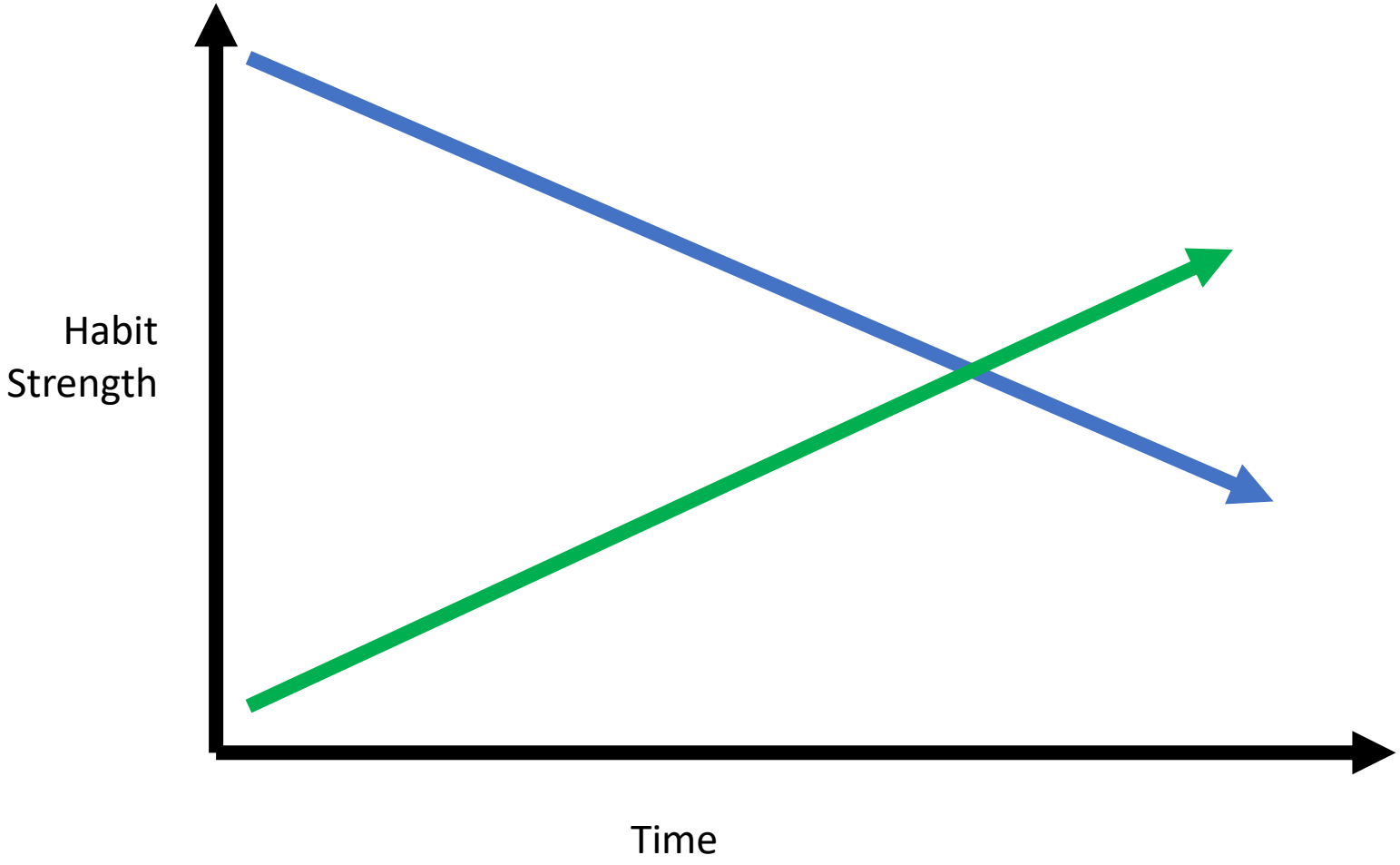
- Key theoretical domains of behavioral maintenance:

Habit

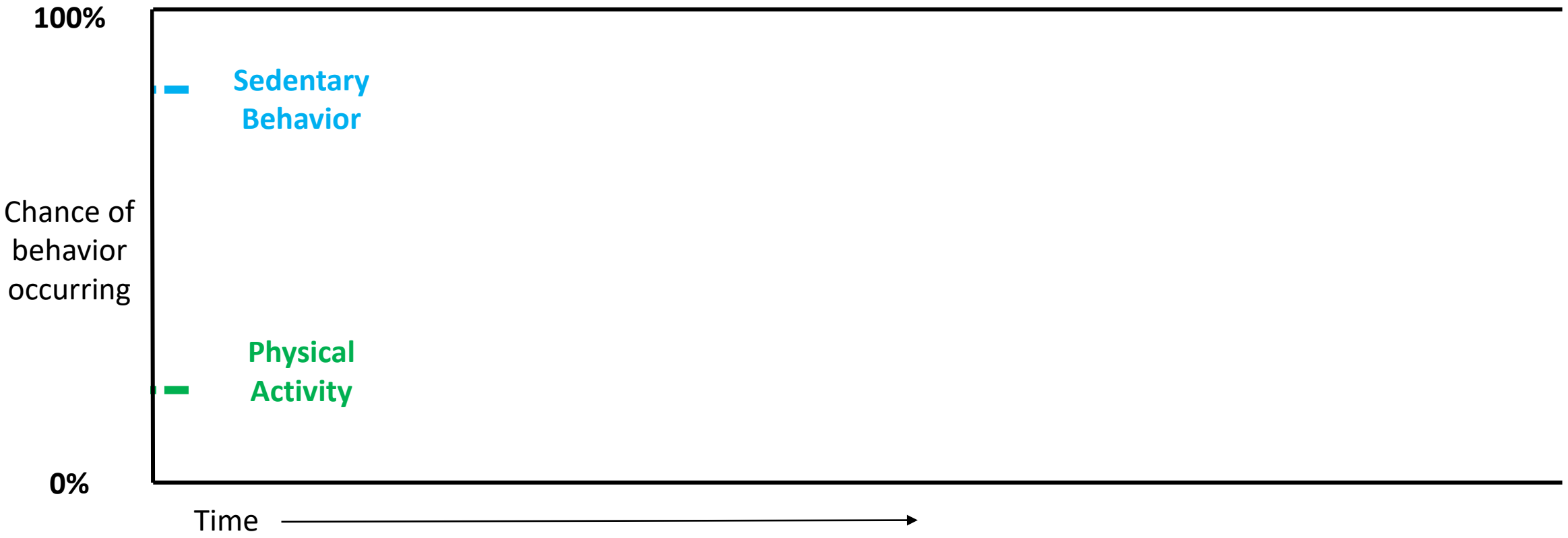
- An established ongoing behavioral pattern
  - Cue/situation → Response
- Example: To snooze? Or not to snooze?
- Habit strength = a measure of how deeply embedded a behavioral pattern is
- Lack of PA is a strong habit for many

Habit Growth & Extinction

- To strengthen new habits, old ones need to fade away
- PA takes time to embed itself, as new habit strengthens



What does PA maintenance look like?



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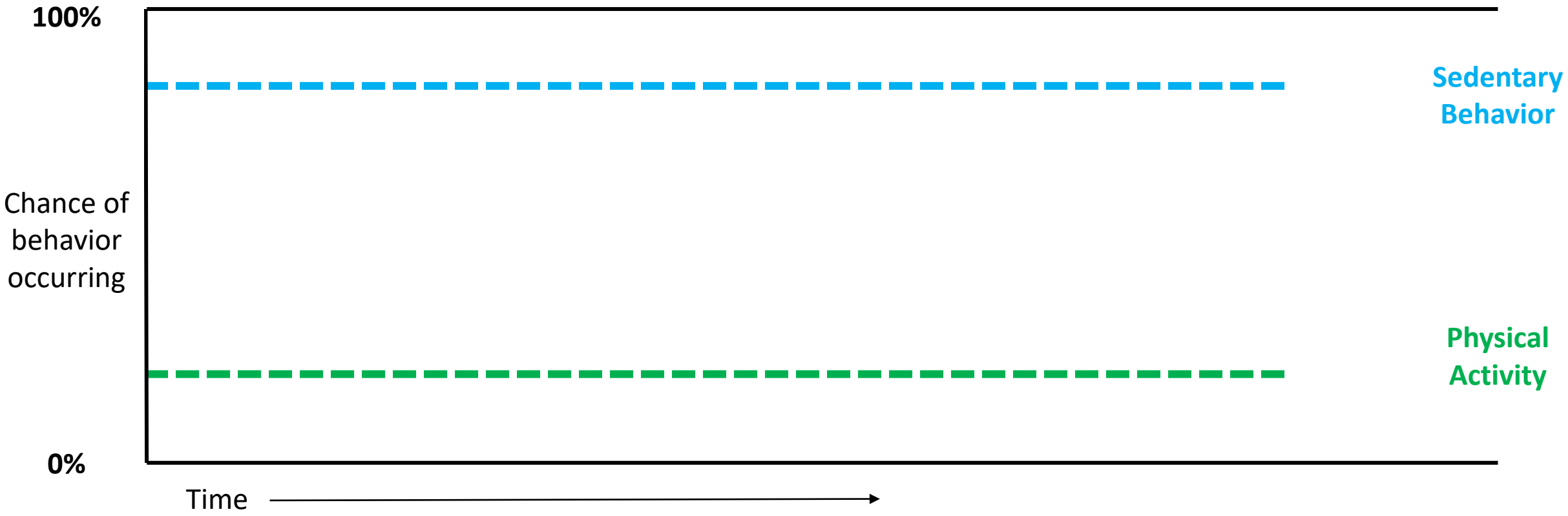

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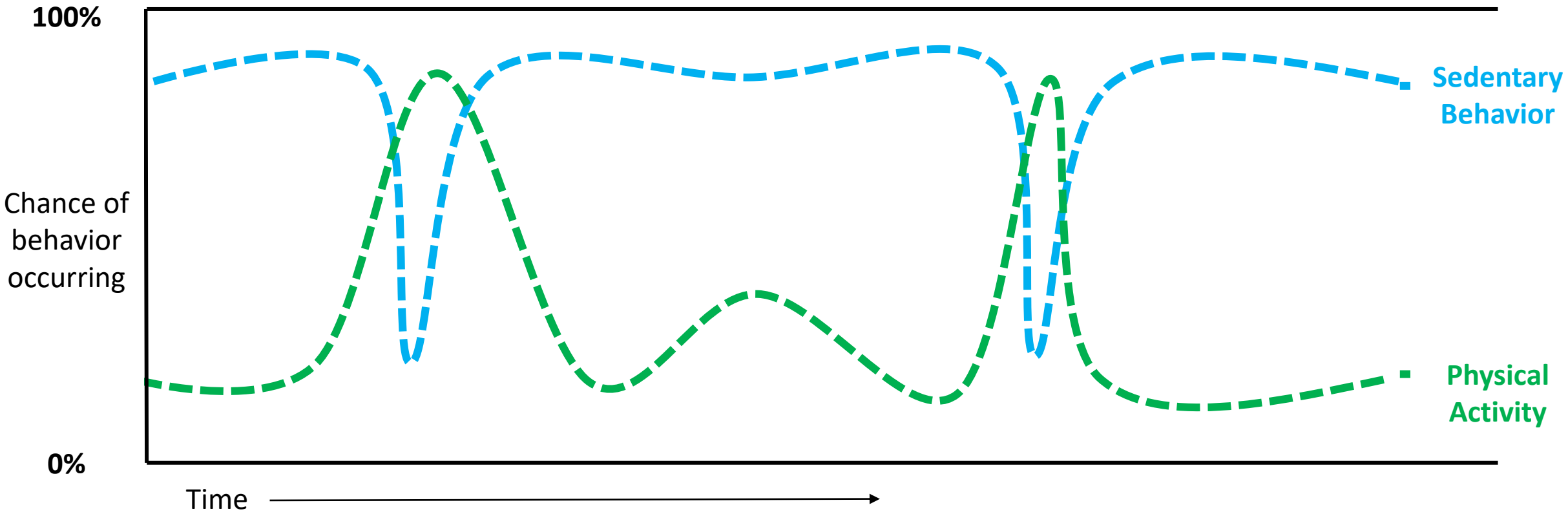

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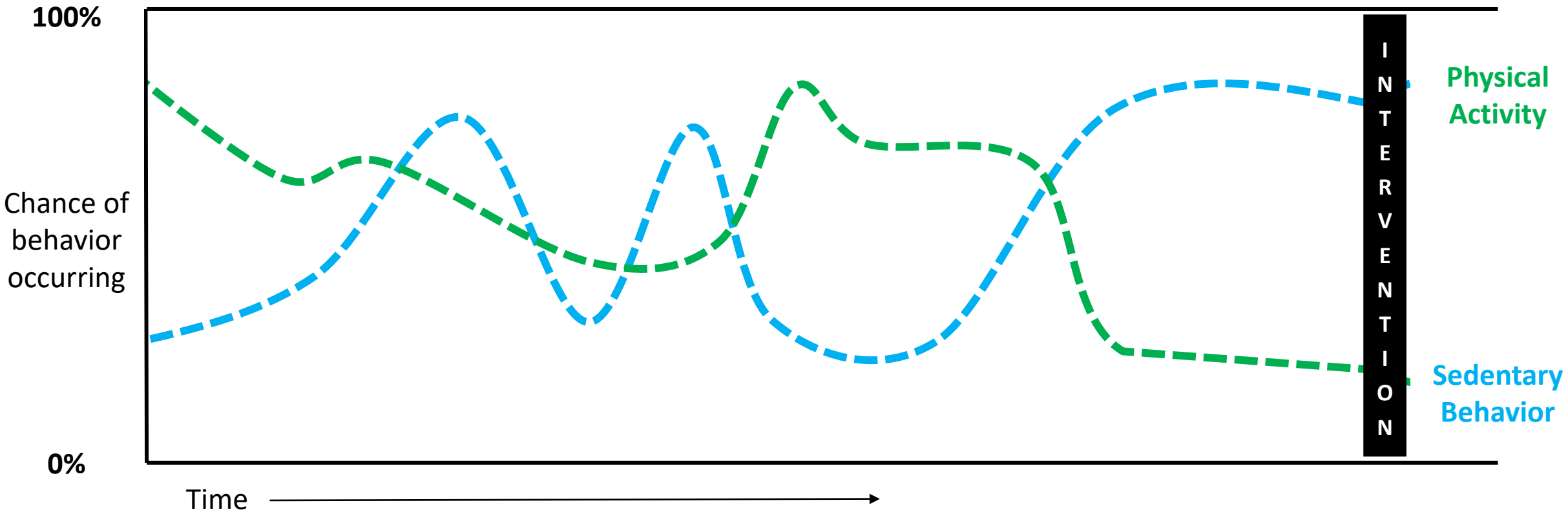

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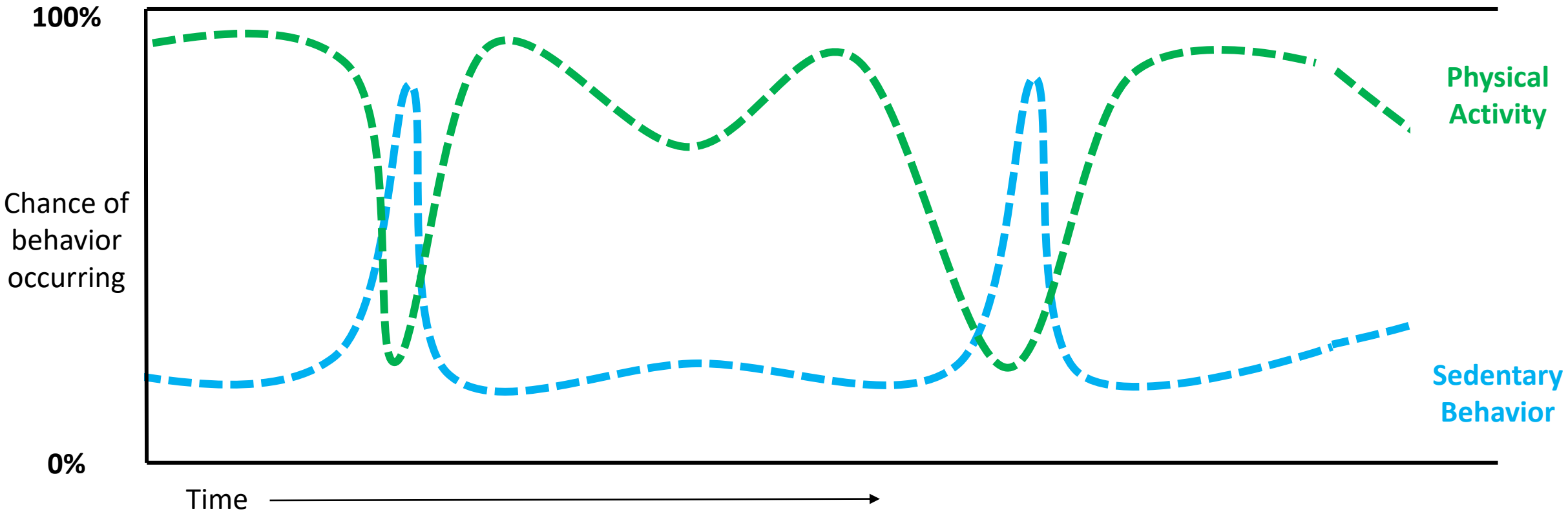

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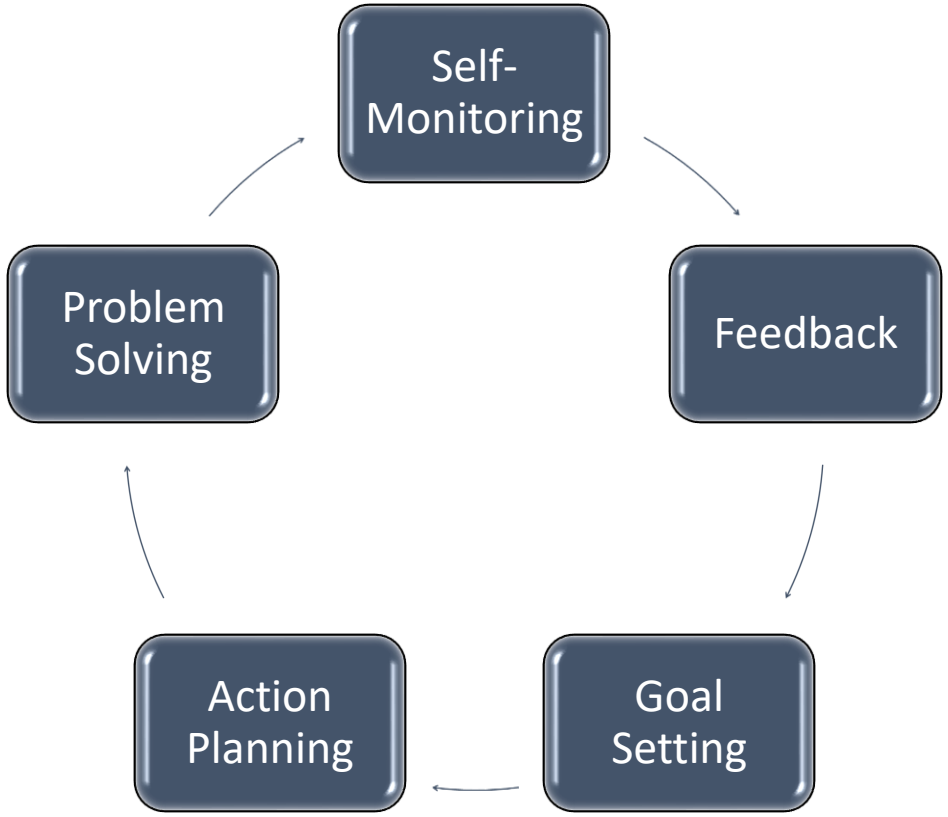
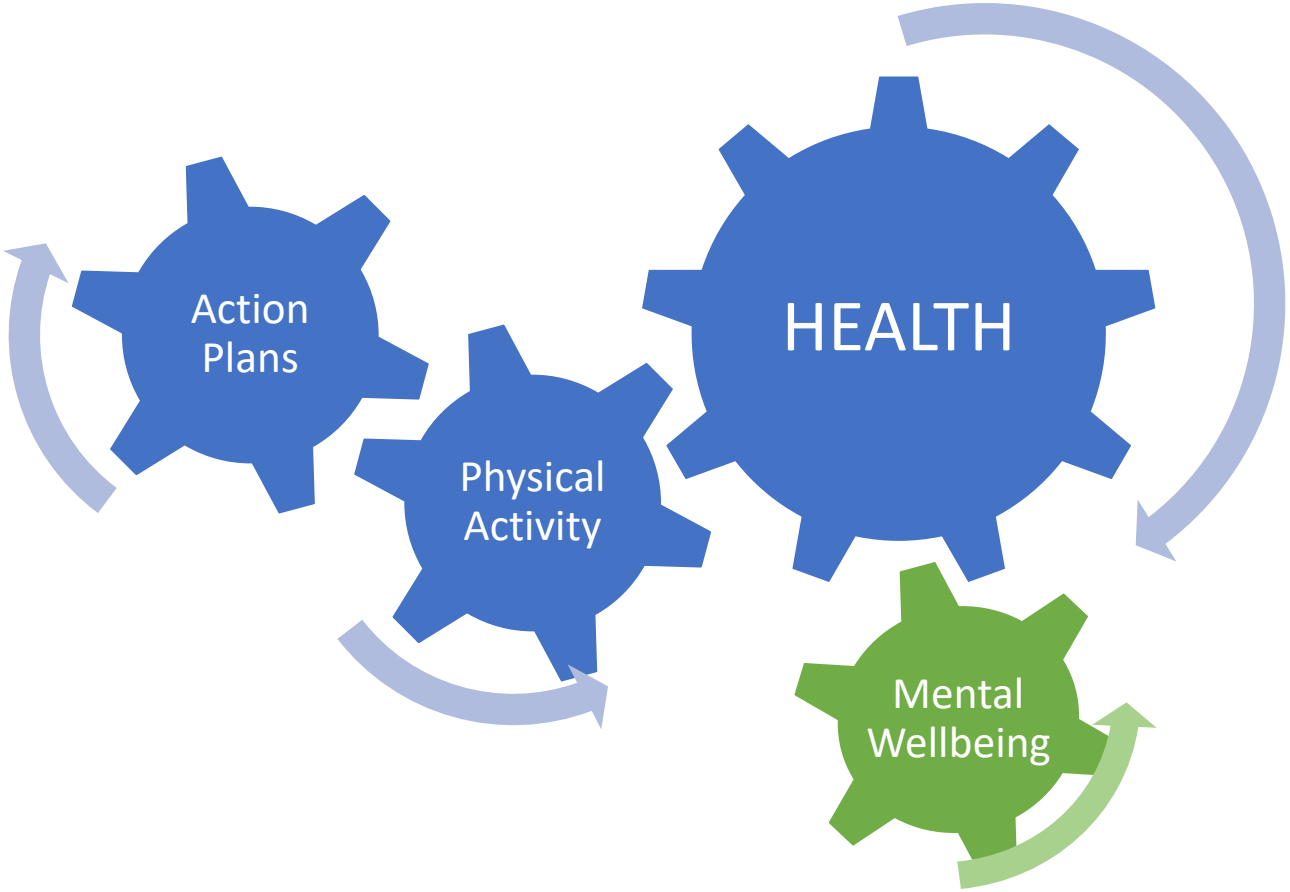
- Key theoretical domains of behavioral maintenance:

Self-Regulation Techniques

- Strong evidence for effectiveness
  - Improving PA and other health behaviors
  - **Increasing motivation for PA**
- Takes cognitive resources
  - Too demanding to do continuously



Self-regulation = goal pursuit



- Peoples' behaviors are in service of higher order goals
- These higher order goals operate even when people are not consciously aware of them
- Deficits in higher order goals can motivate behavior change

Theories of Maintenance

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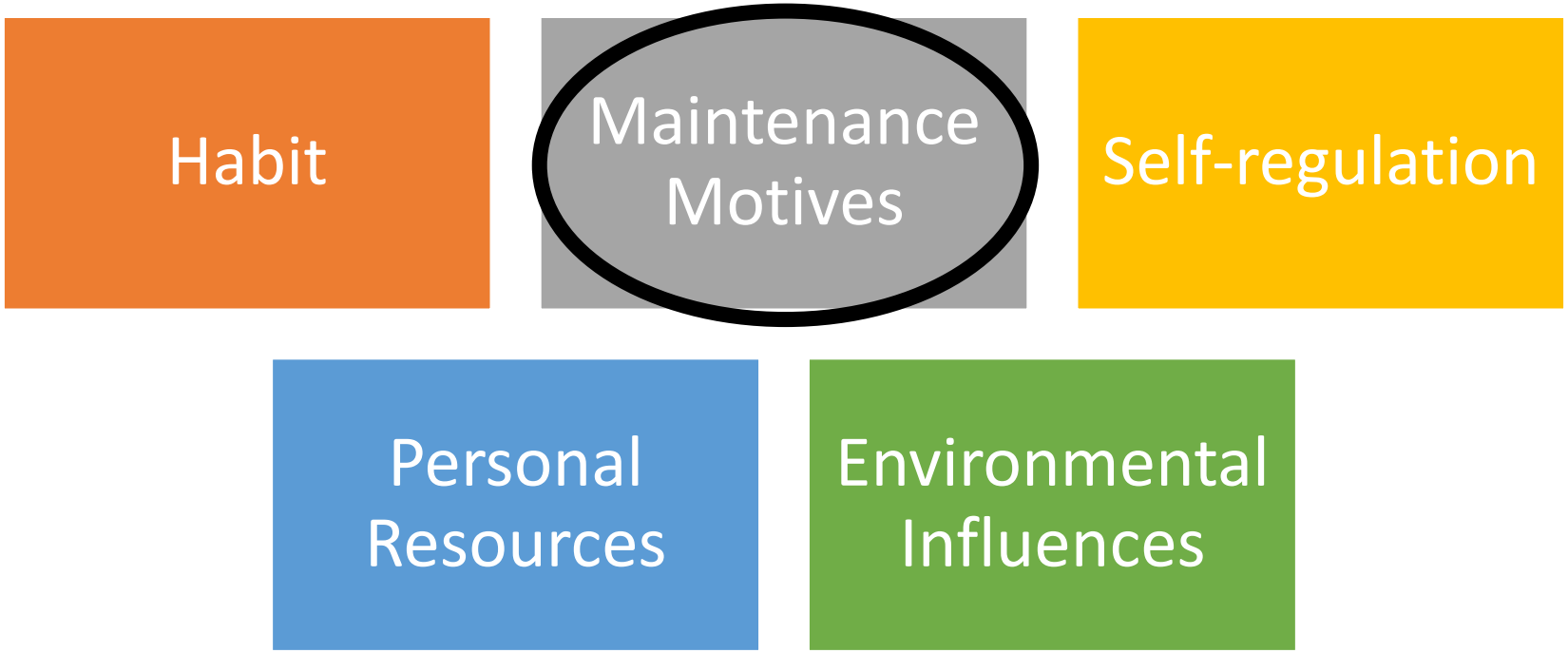


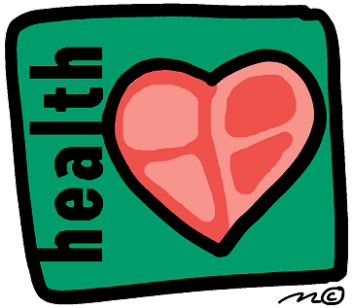
Maintenance Motives

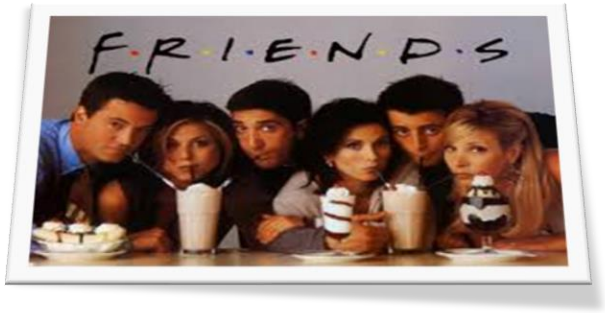
- People **start** new behaviors based on what they **think** will happen.

- People **maintain** behaviors based on what **actually** happens.
  - –Rothman, Sheeran & Wood, 2009

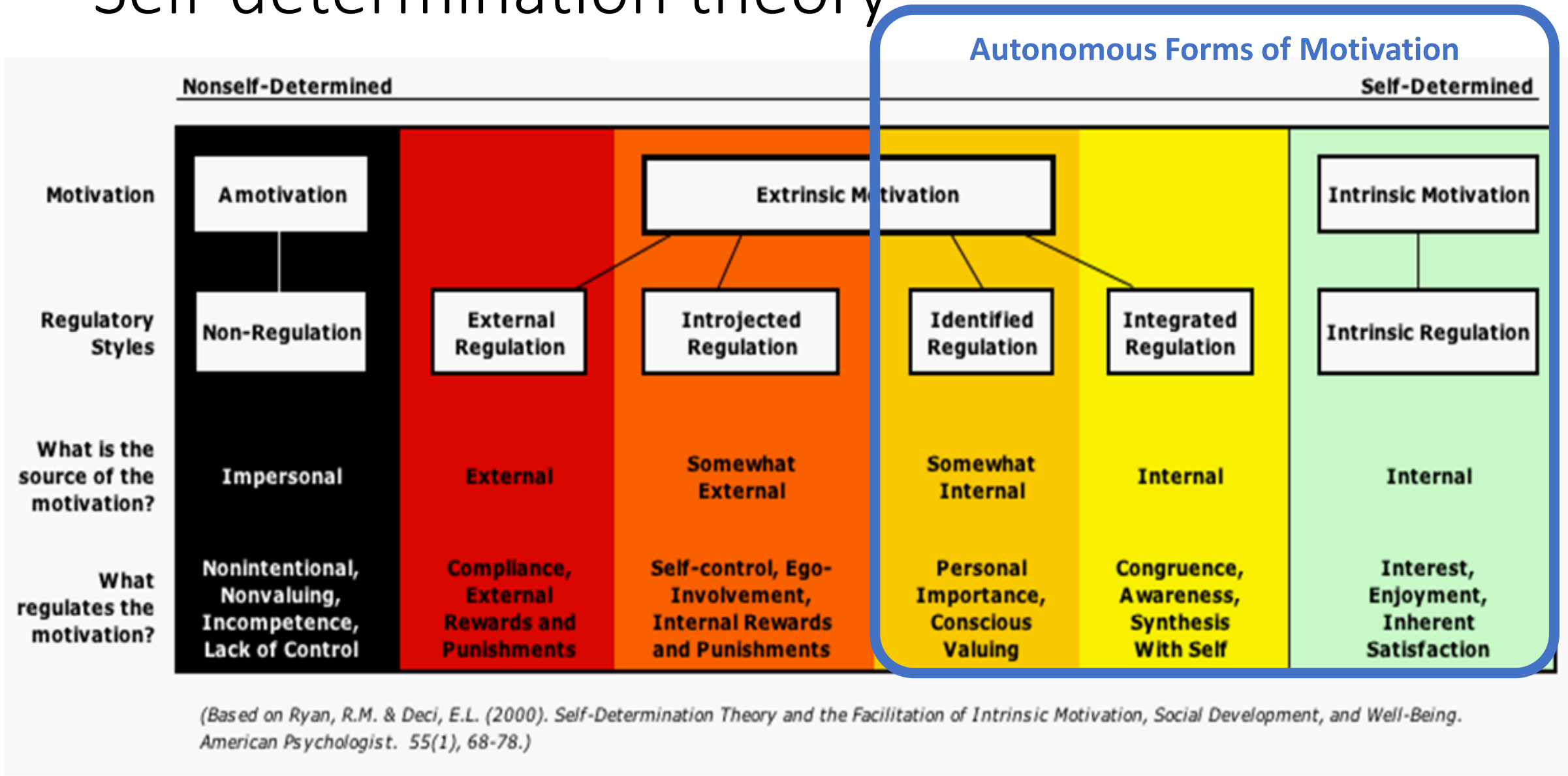
- To maintain a behavior, people must feel that it is worth it (i.e., rewarding)

What motivates your PA?



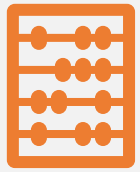


Self-determination theory



(Based on Ryan, R.M. & Deci, E.L. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. American Psychologist. 55(1), 68-78.)

Autonomous Motivation = Good!

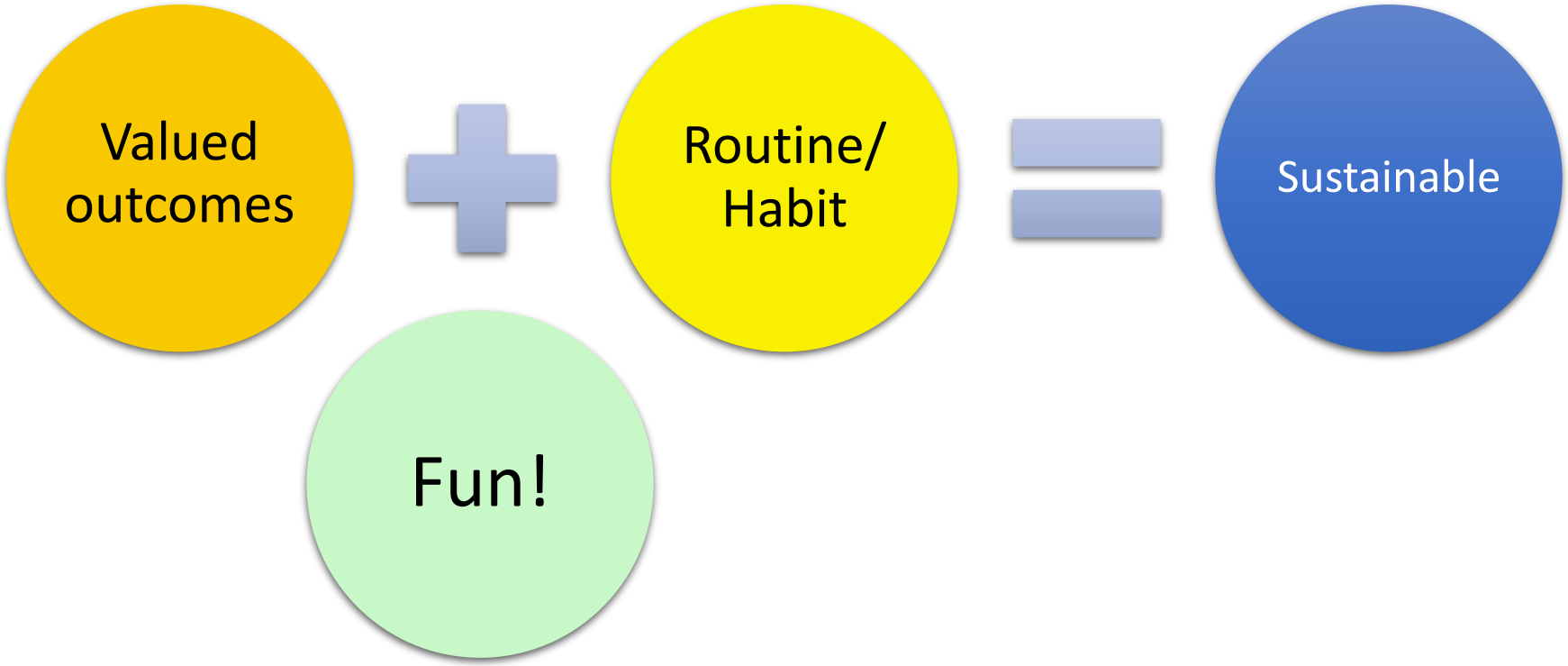


Predicts behavioral maintenance, task persistence

Predicts performance

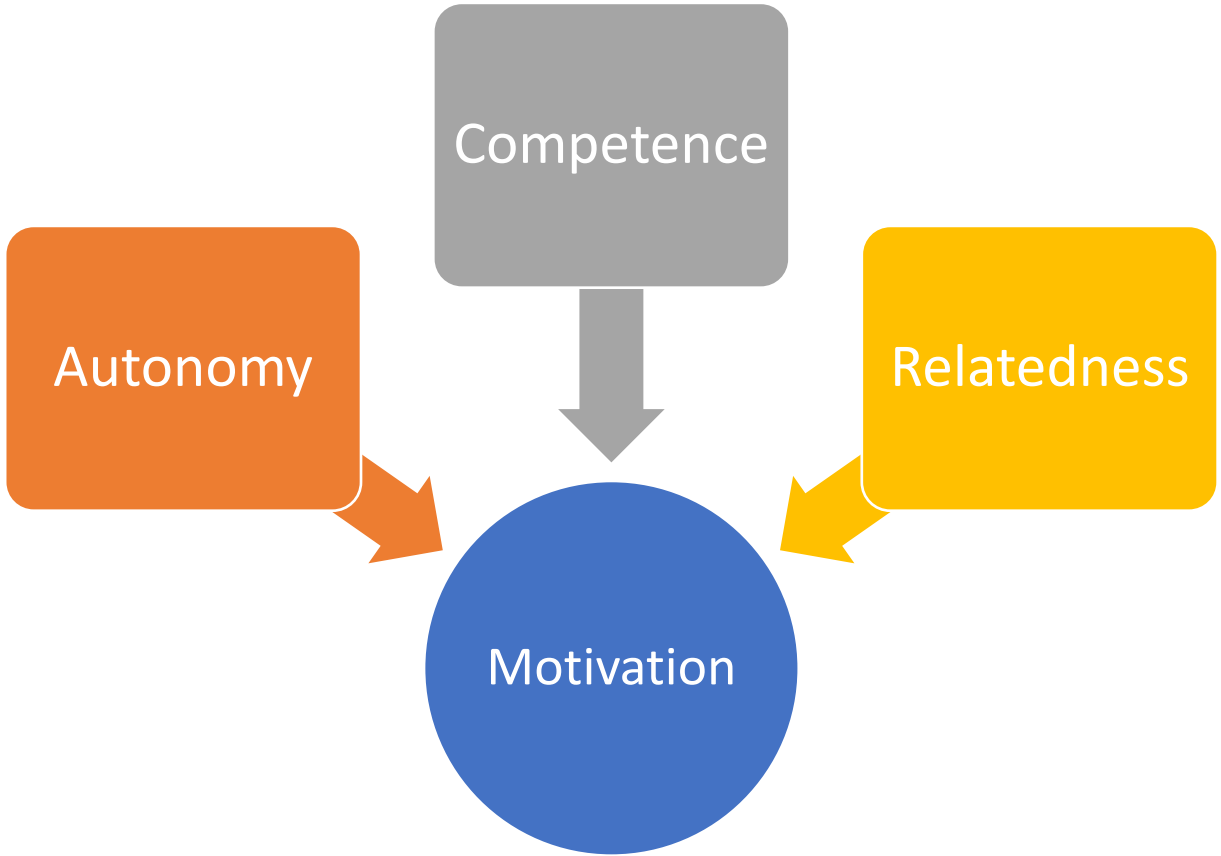
Predicts well-being

Keeping behavior going



Self-determination theory

- Behaviors that satisfy peoples' basic psychological needs will be autonomously motivated, and therefore better maintained



What *should* interventions do?

Be less directive when giving information

Automate self-regulation to reduce cognitive burden

Use fun to guide behavior

The title of this talk said “Fun”, when will we get to that part?

Pokémon Go


06:00
Lv 1
Paula
Nearby
POKÉMON
GO
quirtle
CP 278
06:00
Verizon LTE
1:04 PM
78%
98.2
Persian CP 289
Eevee CP 360

Published on 6.12.2016 in Vol 18, No 12 (2016): December

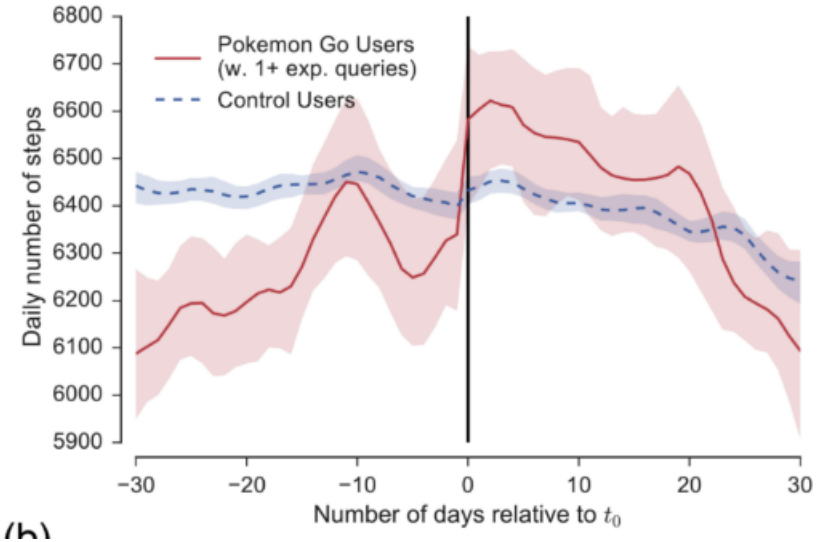
Influence of Pokémon Go on Physical Activity: Study and Implications

Tim Althoff [1]; Ryen W White [2]; Eric Horvitz [2]

Citation

Please cite as:

Althoff T, White RW, Horvitz E
Influence of Pokémon Go on Physical Activity: Study and Implications
J Med Internet Res 2016;18(12):e315
doi: 10.2196/jmir.6759



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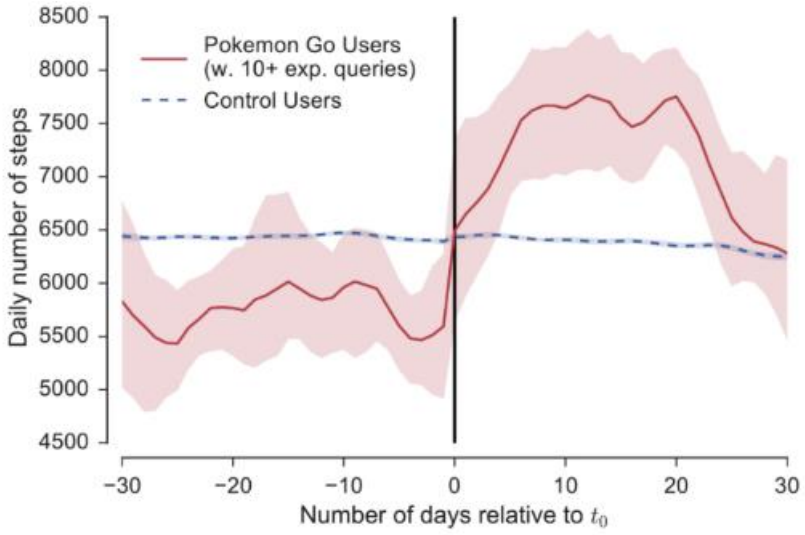

Robust effect across observational studies

- Across 17 studies (n=33,108): difference of 1446 steps per day between players and non-players

American Journal of Preventive Medicine
Volume 58, Issue 2, February 2020, Pages 270-282

Review Article

Impact of Pokémon Go on Physical Activity: A Systematic Review and Meta-Analysis

Madina Khamzina MPH [1], Kaustubh V. Parab MPH, MBBS [1], Ruopeng An PhD [1, 2], Tiffany Bullard PhD [1], Diana S. Grigsby-Toussaint PhD [3]


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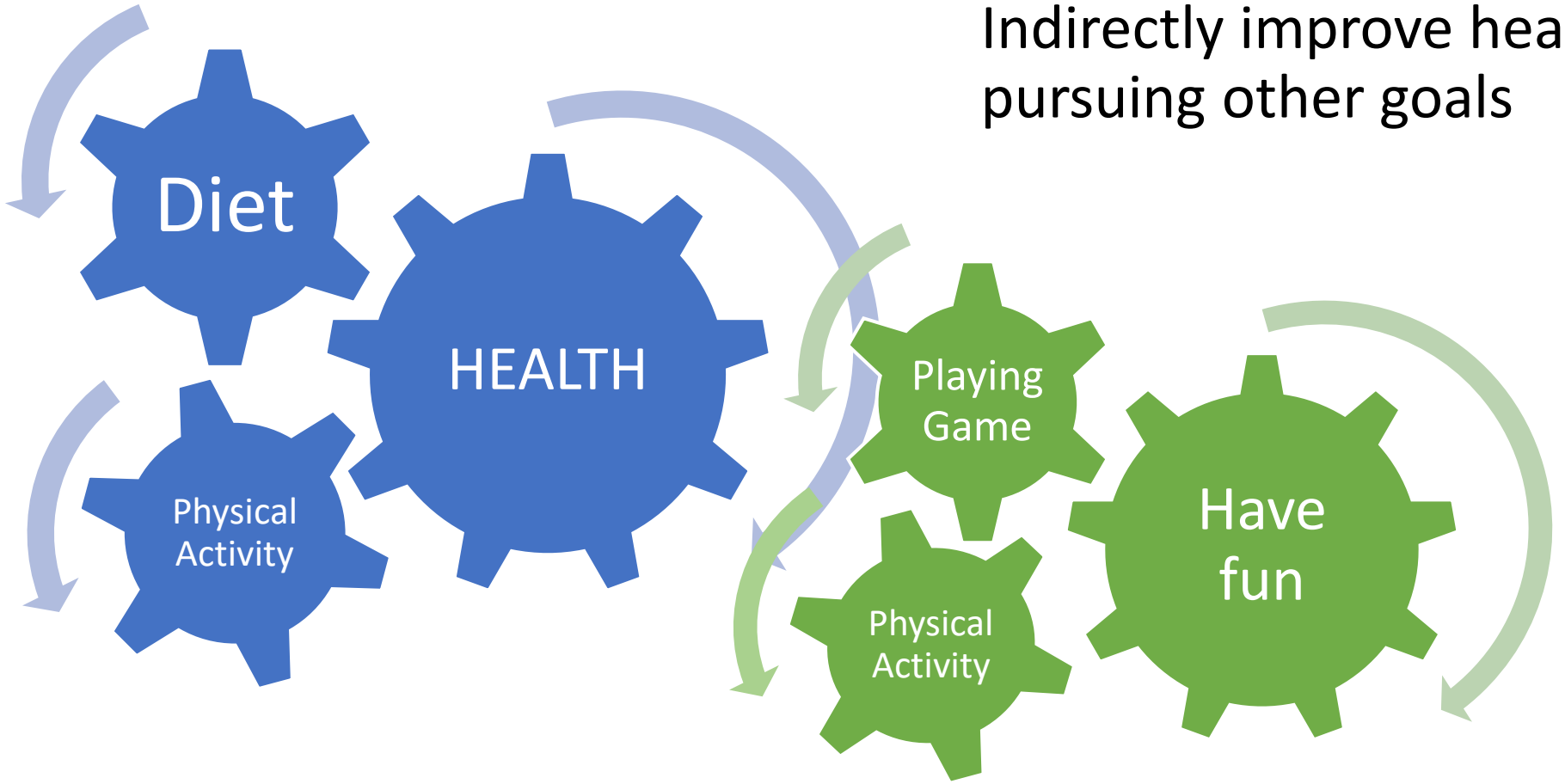
Games can bypass self-regulation



Indirectly improve health while pursuing other goals

SDT in video games?

- Video games are addictive
  - *Internet Gaming Disorder* in DSM V
  - Prevalence ~4.5% (Fam, 2018)

- SDT might explain why

Motiv Emot
DOI 10.1007/s11031-006-9051-8

ORIGINAL PAPER

The Motivational Pull of Video Games: A Self-Determination Theory Approach

Richard M. Ryan · C. Scott Rigby · Andrew Przybylski

Competence

- Problem solving
- Progress toward mastery
- Frequent and direct feedback

Autonomy

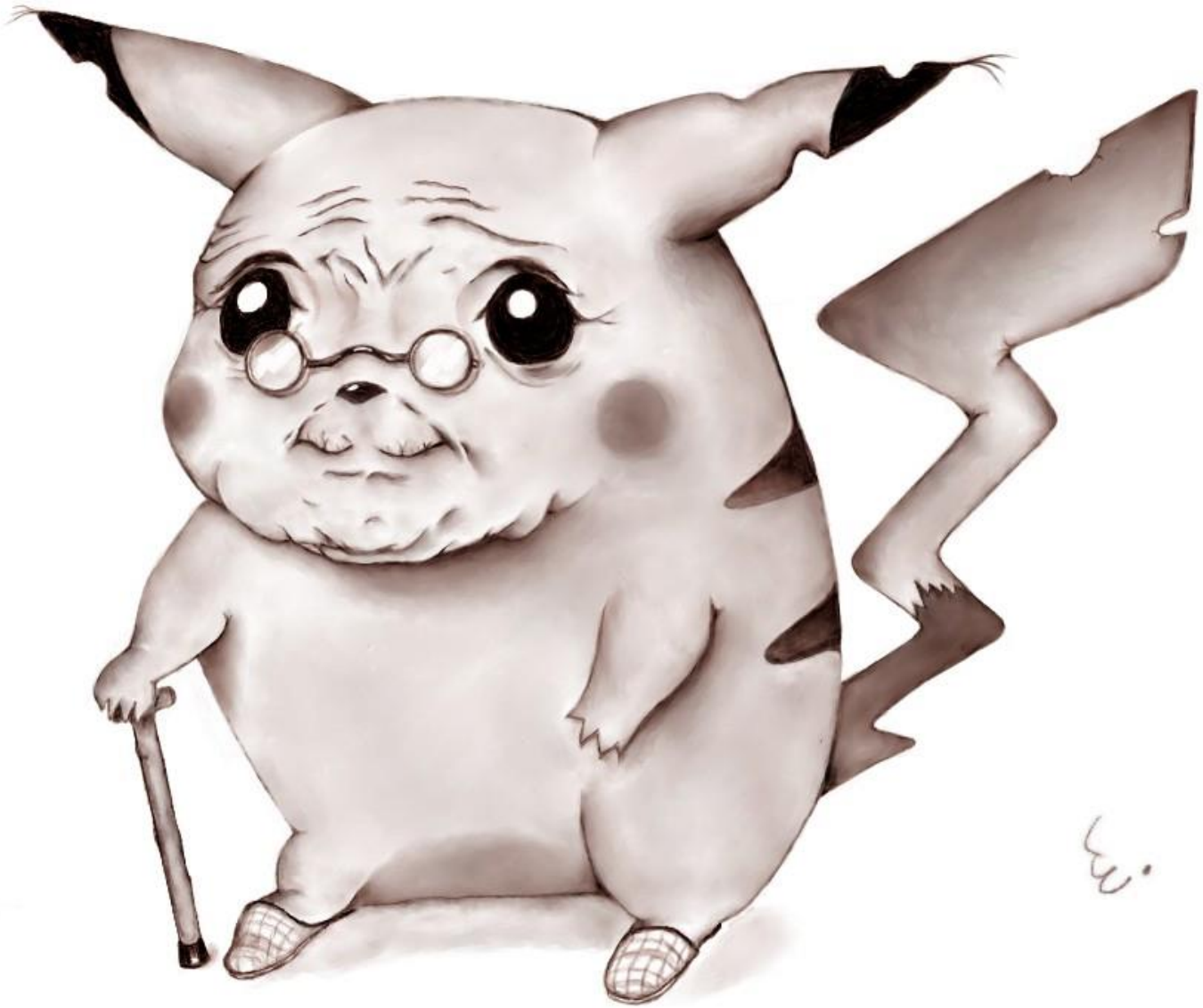
- Player-centered
- Experimentation (less fear of failure)
- Customization

Relatedness

- Sense of purpose or goals
- Creation of meaning
- Social interactions

Kevin Werbach

What happens when Pokémon Go gets old?



Drawing by Eponymous (2011) via DeviantArt

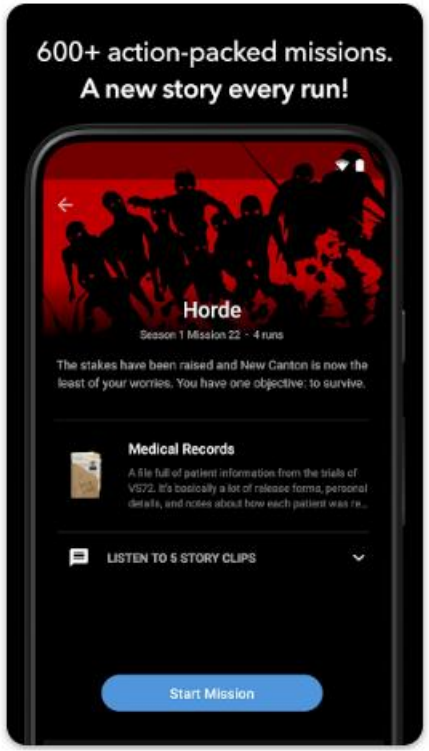
Dance Dance Revolution

- Kick it old school…

- Also similar console-based options:
  - Nintendo Wii
  - Xbox Kinect

Zombies, Run!


Get fit. Escape zombies.
Become a hero!
Ammo Run
Distance
5.15KM
Total Time
51:23
Supplies
11
Avg. Pace
9' 59"/KM
Splits


600+ action-packed missions.
A new story every run!
Horde
Season 1 Mission 22 · 4 runs
The stakes have been raised and New Canton is now the least of your worries. You have one objective: to survive.
Medical Records
LISTEN TO 5 STORY CLIPS
Start Mission


Walk, jog or run – it's up to you.
Mix your music & our thrilling story!
Voodoo Child
2.43
Kilometres
32:12
Time
5:09
Pace


Collect supplies as you move.
Build and defend your base!
Help
1340/1504

Wokamon


586
26.36aa
LV263 LELE
LEVEL UP
SPEND 305.63aa XP TO LEVEL UP
RAISE WOKAMON
&
GET FIT!!!


586
26.36aa
LV512 PANDO
16.87aa / 322.5aa
SPEND 305.63aa XP TO LEVEL UP
CONSTANT REWARDS
KEEP YOU GOING!!!

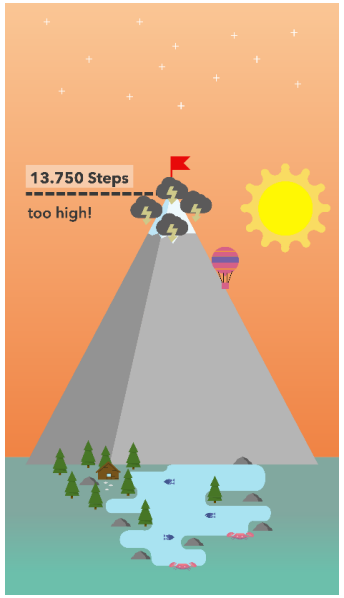

01 APR
1000
STEPS
THAT'S THE HAPPINESS OF 3.5 OF FLUFFY PUPPIES
1000
34
0.67
1000
05.24 PM - 05.54 PM
TRACK ACTIVITIES
&
FITNESS STATS


WOKAMONS
5.67K
MORE WOKAMONS AND LEVELS = MORE CRYSTALS
CURRENT RATE: 1 TIMES MORE CRYSTALS
LV2 LELE
37
LEVEL UP
LV1 KIKI
24.00K
LEVEL UP
LV1 COCON
36.00M
LEVEL UP
UNLOCK & RAISE
MULTIPLE
WOKAMONS

the precious project.eu

- EU-funded project with a wide range of stakeholders:
  - Health Psychologists, Doctors, Dieticians, Graphic Designers, Engineers, Smart Technology Researchers, Device Manufacturers

- Built PA promotion app leveraging gamification principles



Aalto University

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

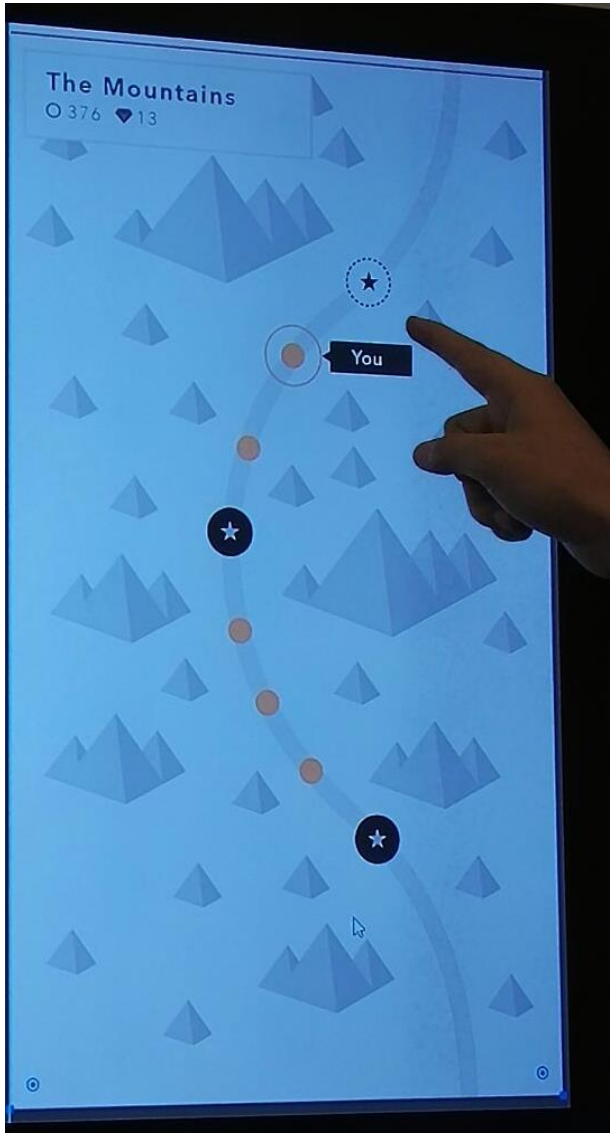
universität wien

One key aim:
Foster FUN!

the precious project.eu

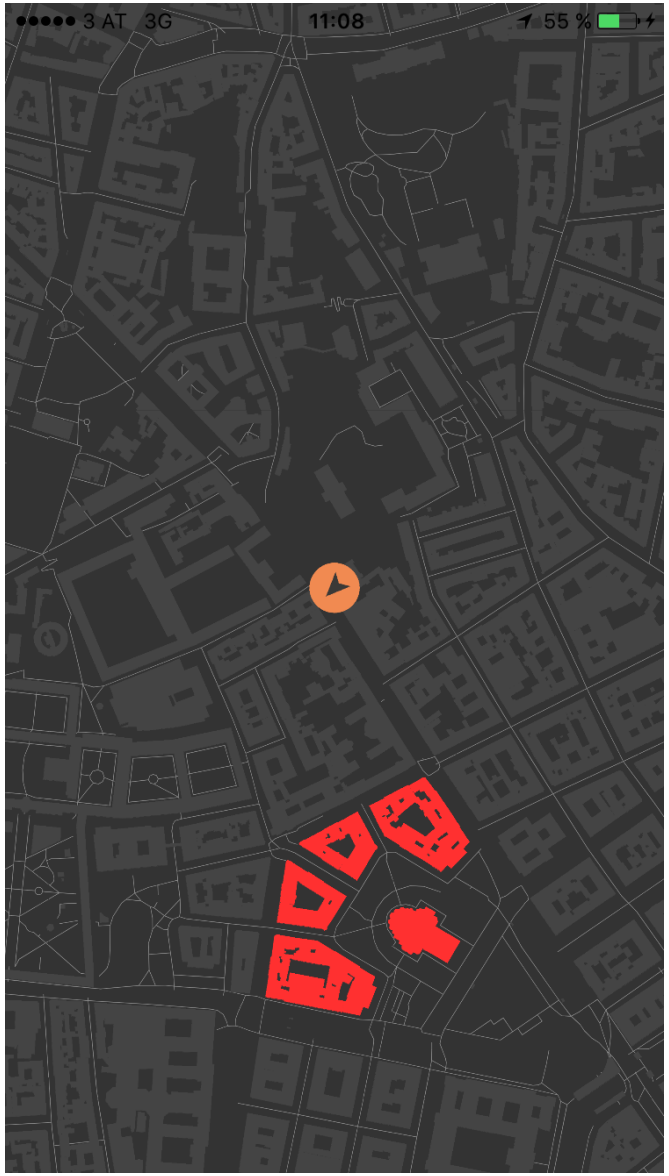
Fostering FUN!

- Healthagotchi
- Journey view
- Virtual currency
- Competitions
- Badges and rewards



Conquer the City

- Based on Open Street Maps and basic GPS functions
- Take control of building or block by walking around it
- See how much of the city you can bring under your control
- Compete against others and bots

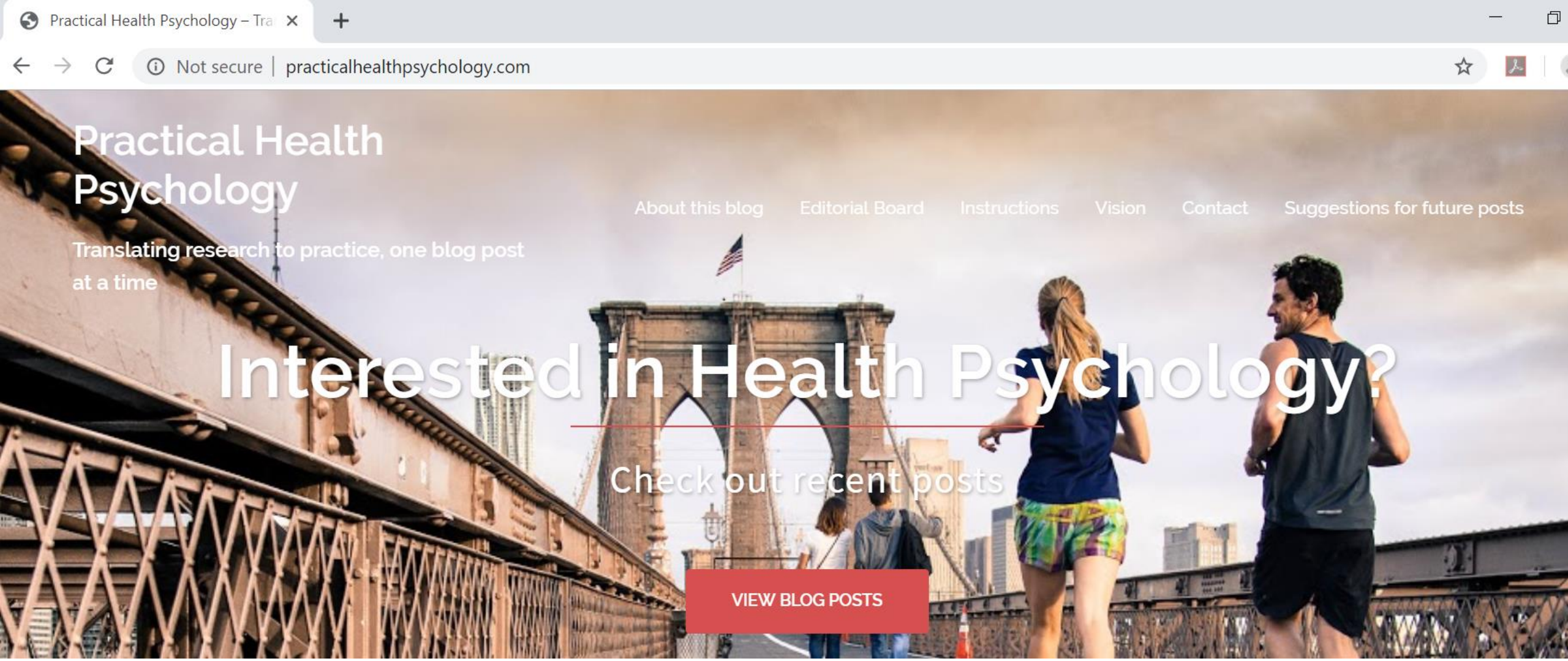


Dilemmas and Controversies

- If an exergame is addicting, could it lead to compulsive or maladaptive training/PA patterns?
- Is it ethical to provide people ways to have fun (even though are really trying to get them to be more physically active)?
- What happens when people stop playing exergames?

Conclusions

- Gamification is in line with the best-known psychological theories of behavioral maintenance (especially SDT)
- Gamification is a **promising** and **underexplored** avenue for PA promotion in all populations, but especially children/adolescents.
- As with all interventions: One size will not fit all!
- Issues of addiction and misuse require adverse events monitoring



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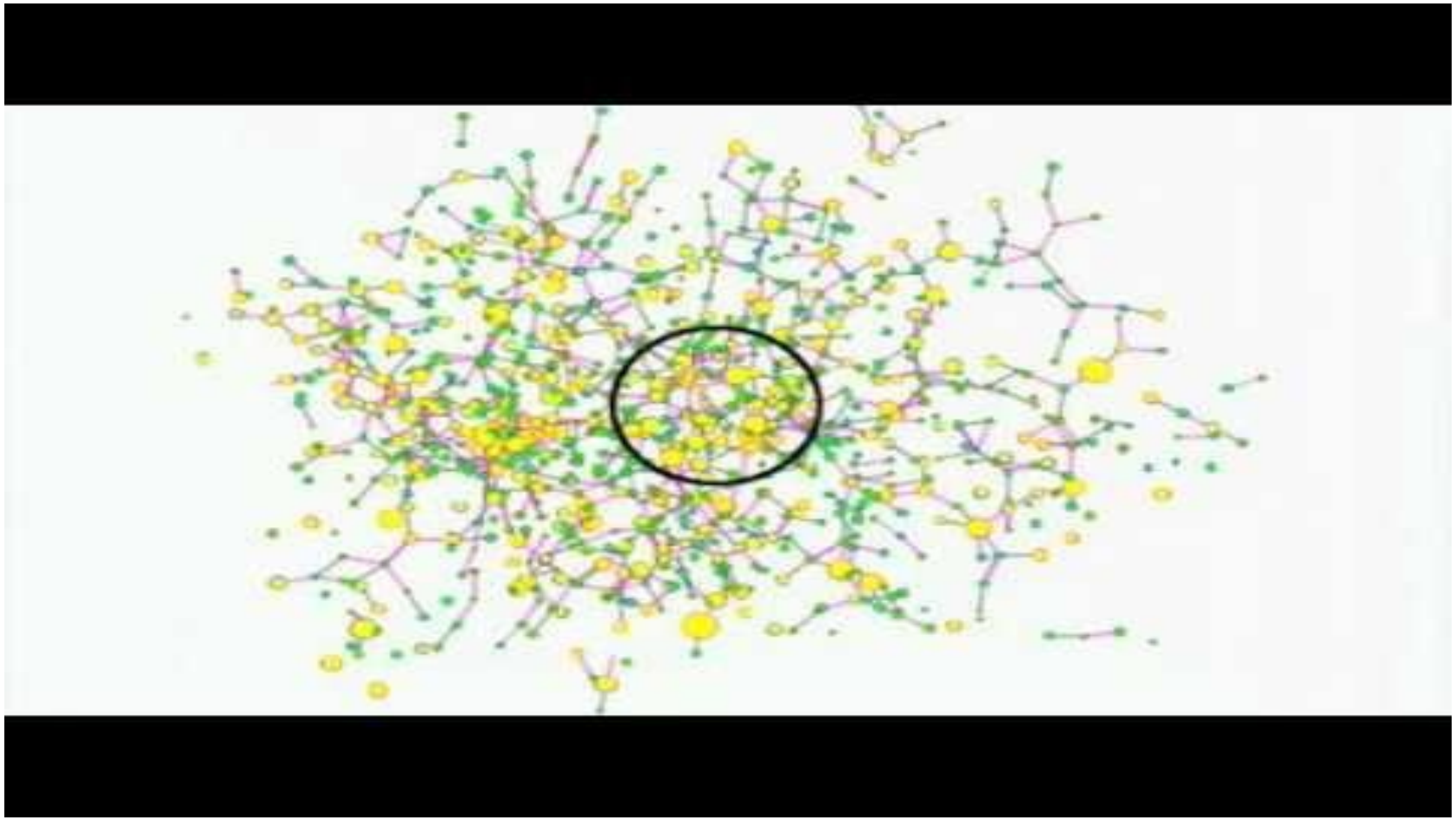
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Thank you!

@keeganknittle

Social opportunity



- Christakis & Fowler, 2007