

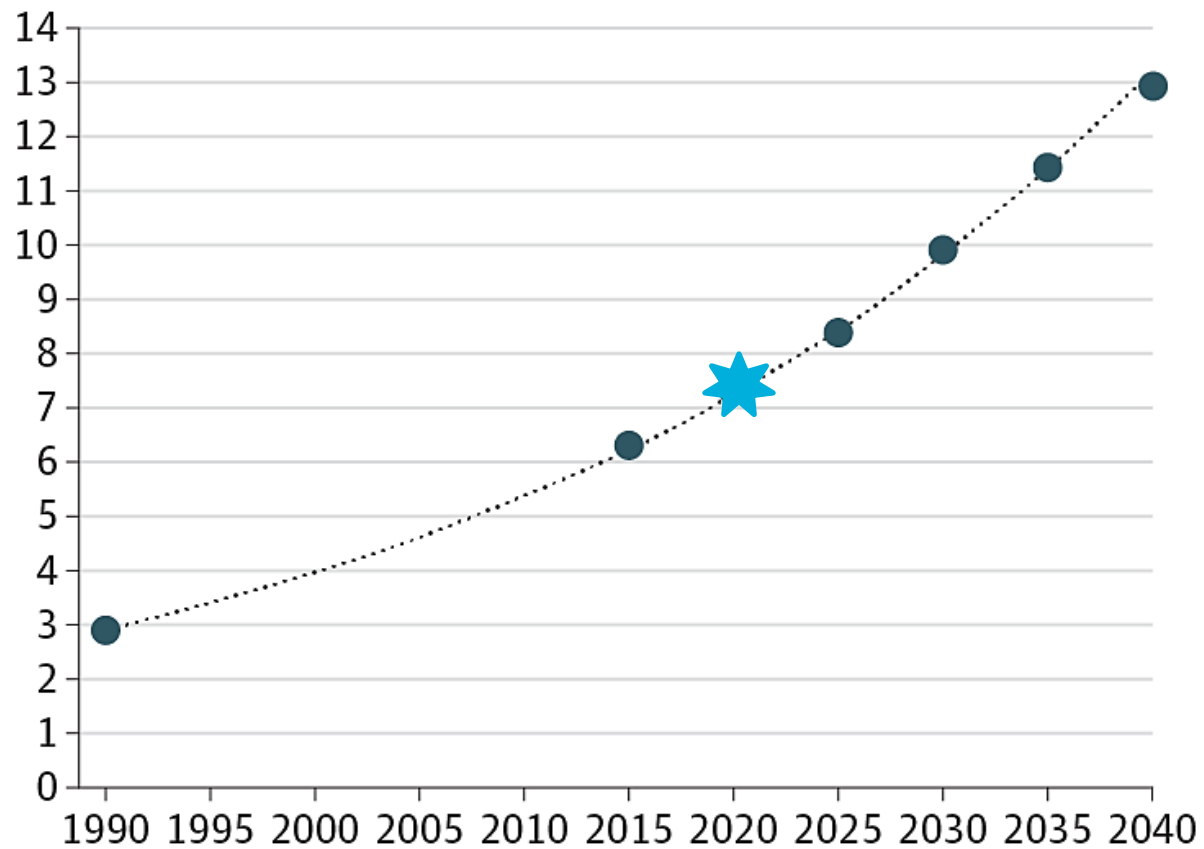
Parkinson: Pesticiden & Bewegen

Jolien Bogers & Thomas Oosterhof

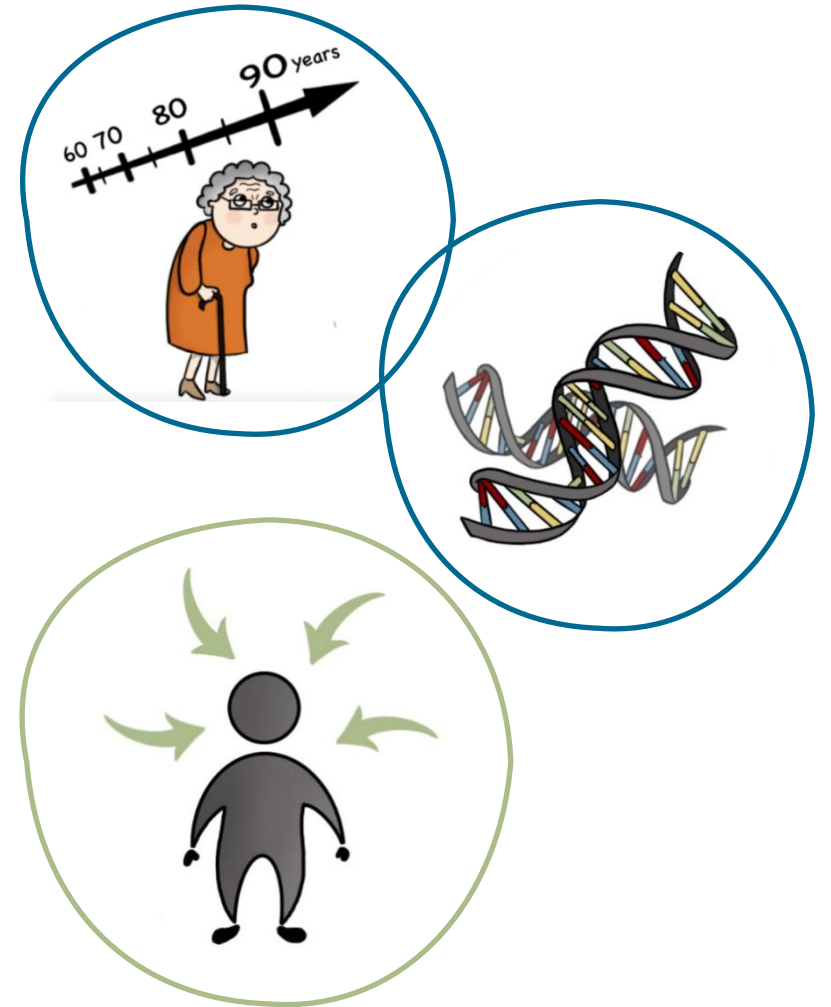
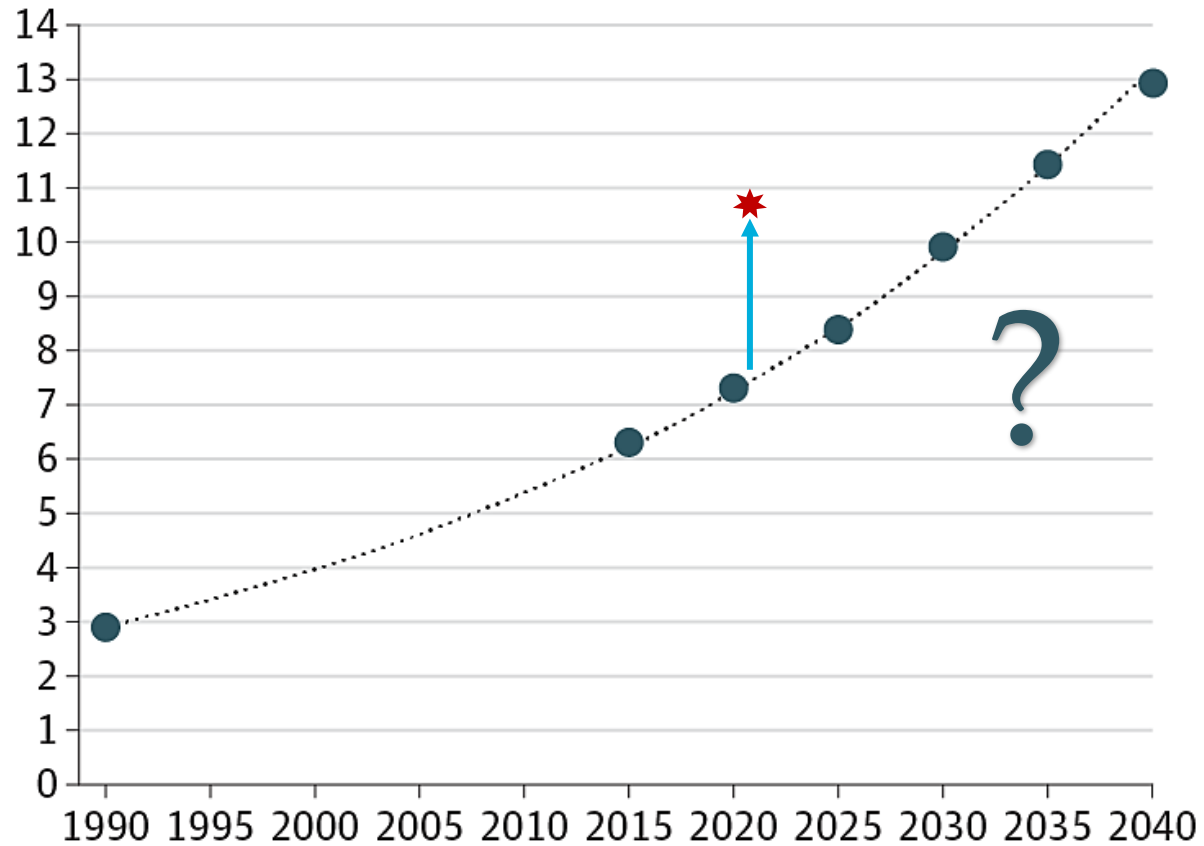
19 juni 2025

Onderzoek door het Expertisecentrum voor Parkinson & Bewegingsstoornissen

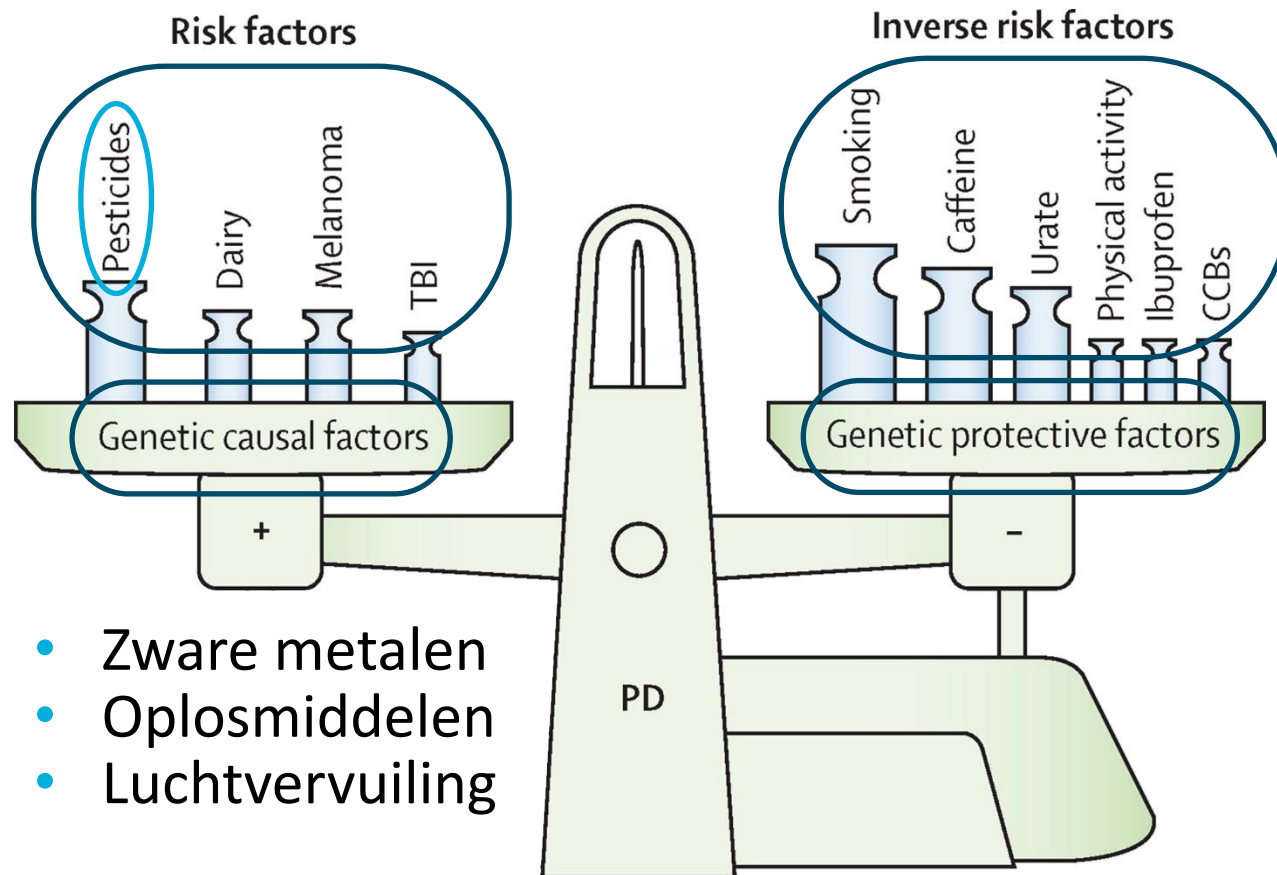
Aantal
mensen
met de
ziekte van
Parkinson
(miljoen)



Aantal
mensen
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ziekte van
Parkinson
(miljoen)



*Dorsey & Bloem. JAMA Neurol. 2018
Global Burden of Disease Study 2021*





Link tussen beroep en Parkinson

Risicofactoren op werkplek neurodegeneratie



Aandoening	Sterke aanwijzingen	Mogelijke associatie, beperkt bewijs
ALS	ELF-MF Militaire dienst	Luchtvervuiling; Dieseluitstoot; Electriche schokken; Metalen (incl. Pb, Cd); Fysieke activiteit; Pesticiden; Silica; Oplosmiddelen; Virale infectie
Parkinson	Pesticiden	ELF-MF; Oplosmiddelen (incl. TCE); Metalen (incl. Pb); Luchtvervuiling
Parkinsonisme	Mangaan	
Dementie	Luchtvervuiling	ELF-MF; Job complexiteit; Job controle; Metalen; Nachtwerk; Geluid; Pesticiden; Oplosmiddelen
MS		Nachtwerk; Organische oplosmiddelen

S. Peters, IRAS (Utrecht University)

Onderzoek risicofactoren neurodegeneratieve aandoeningen

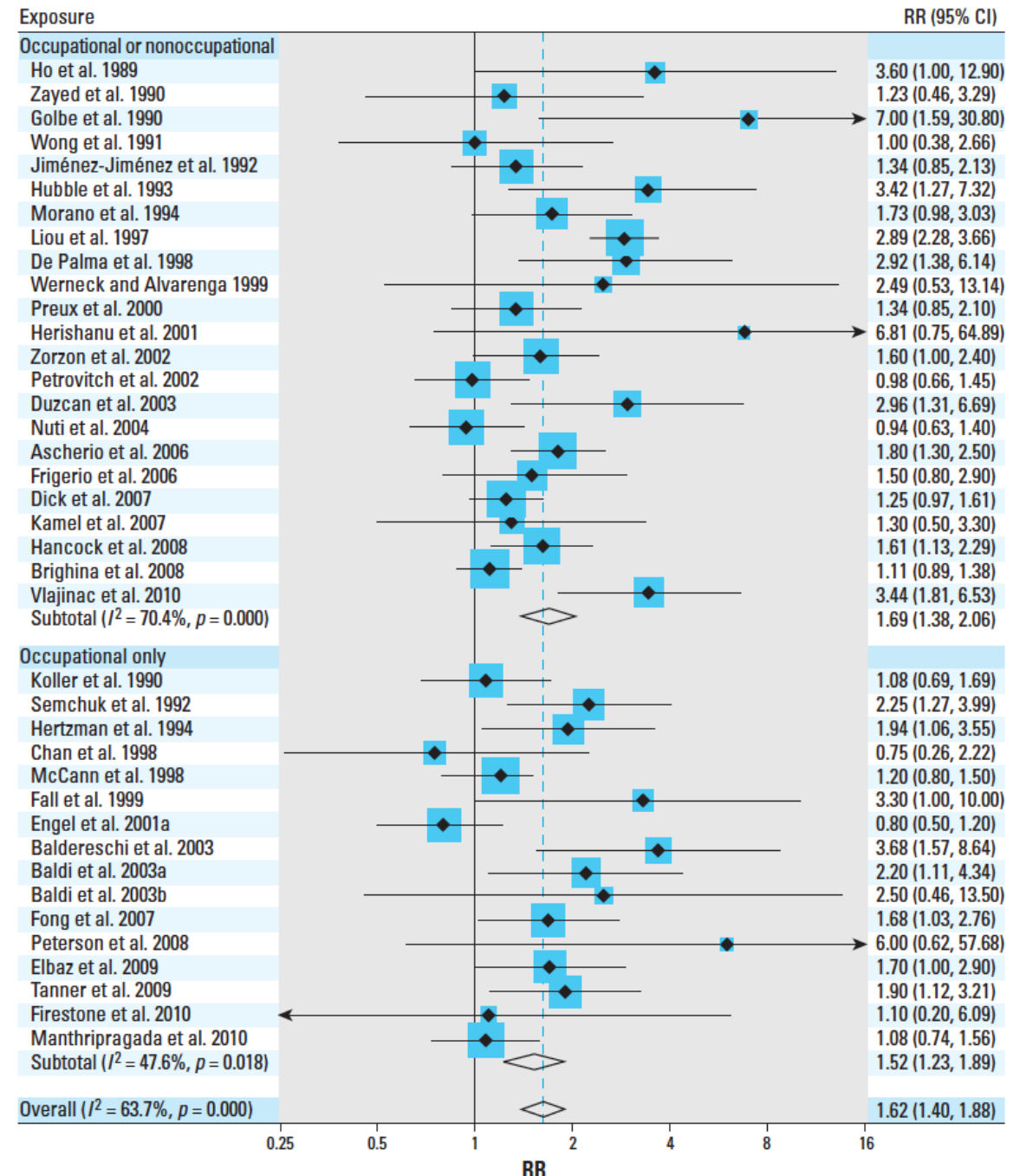
Uitdagingen:

- Ziekte op latere leeftijd, ontstaat niet direct na blootstelling
- Multicausale aandoeningen
- Relatief zeldzaam (vooral ALS)
- Geheugenproblemen (vooral dementie, maar ook ALS en PD)

Beroepsmatige blootstelling aan **pesticiden** en het risico op **Parkinson**

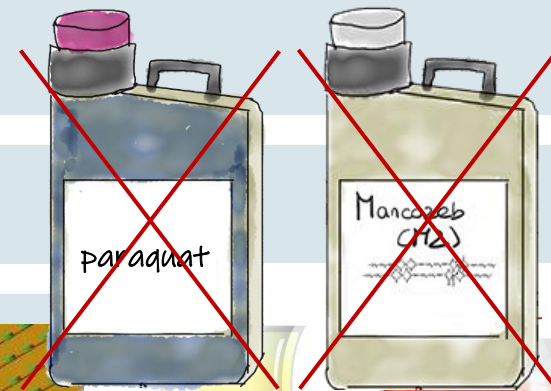
35 +
4 Null

Van der Mark et al. (2012). EHP



✓ Link tussen beroep en Parkinson

✓ Link tussen specifieke pesticiden en Parkinson



?

en middelen?

?

?

inson?

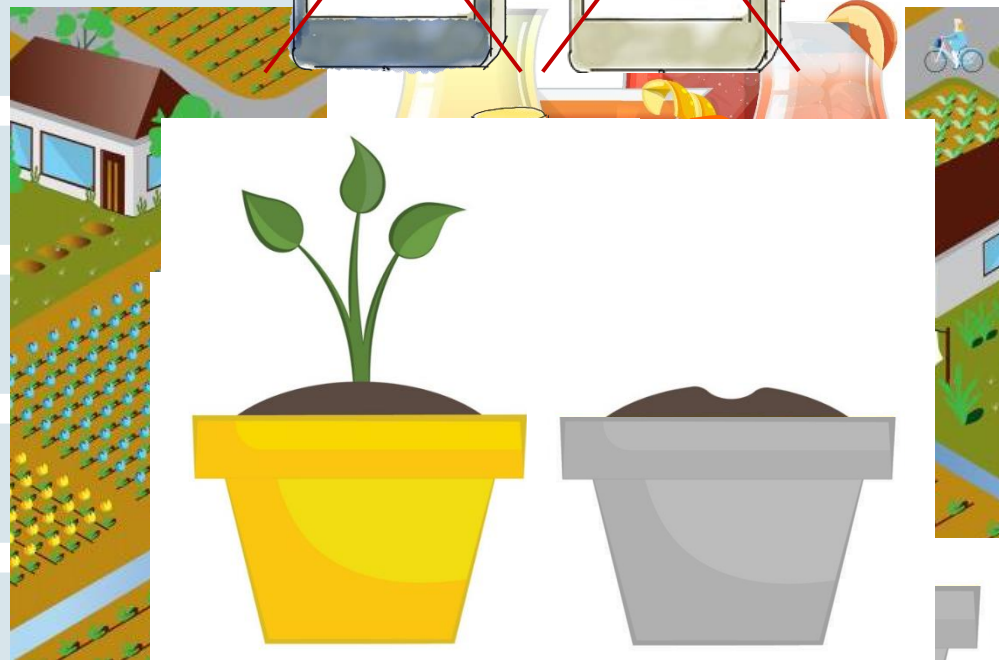
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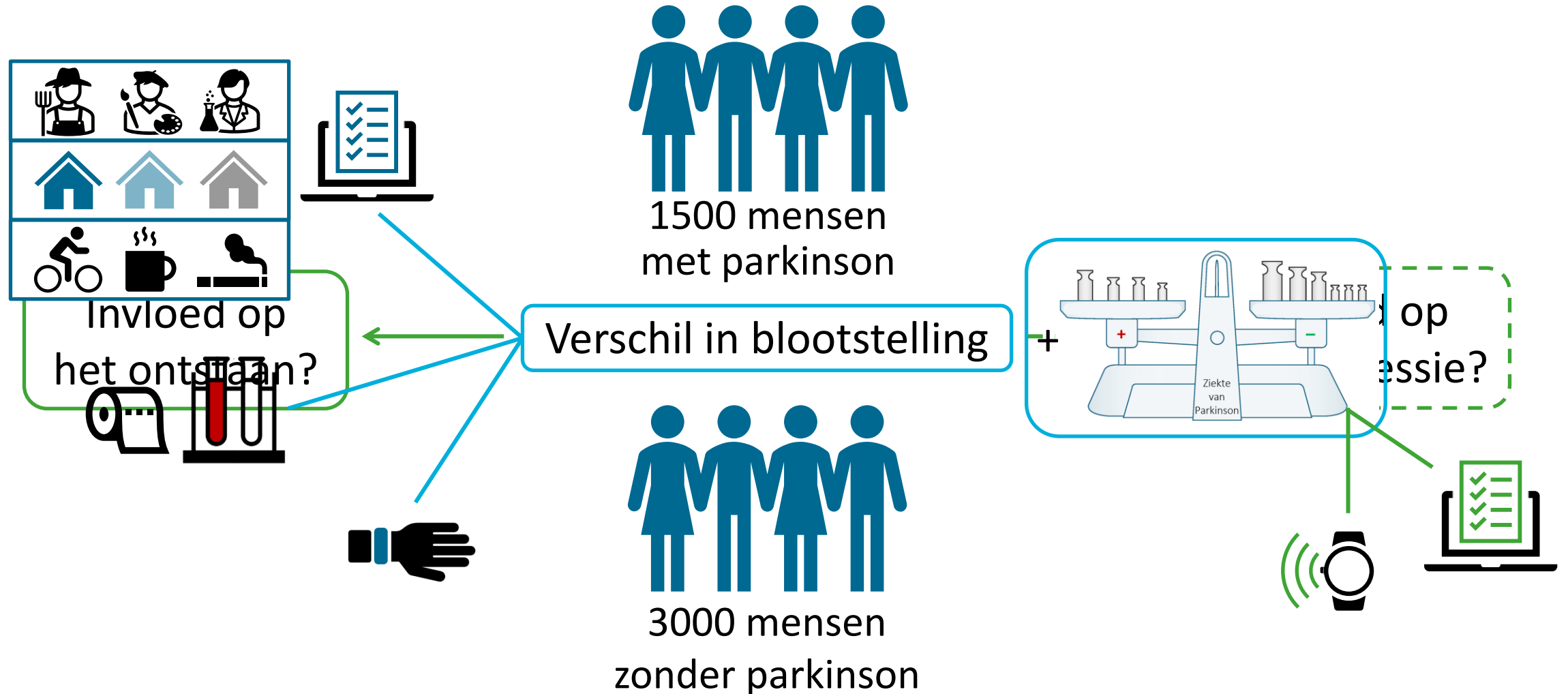
?

rogressie?

?

Situatie in Nederland:

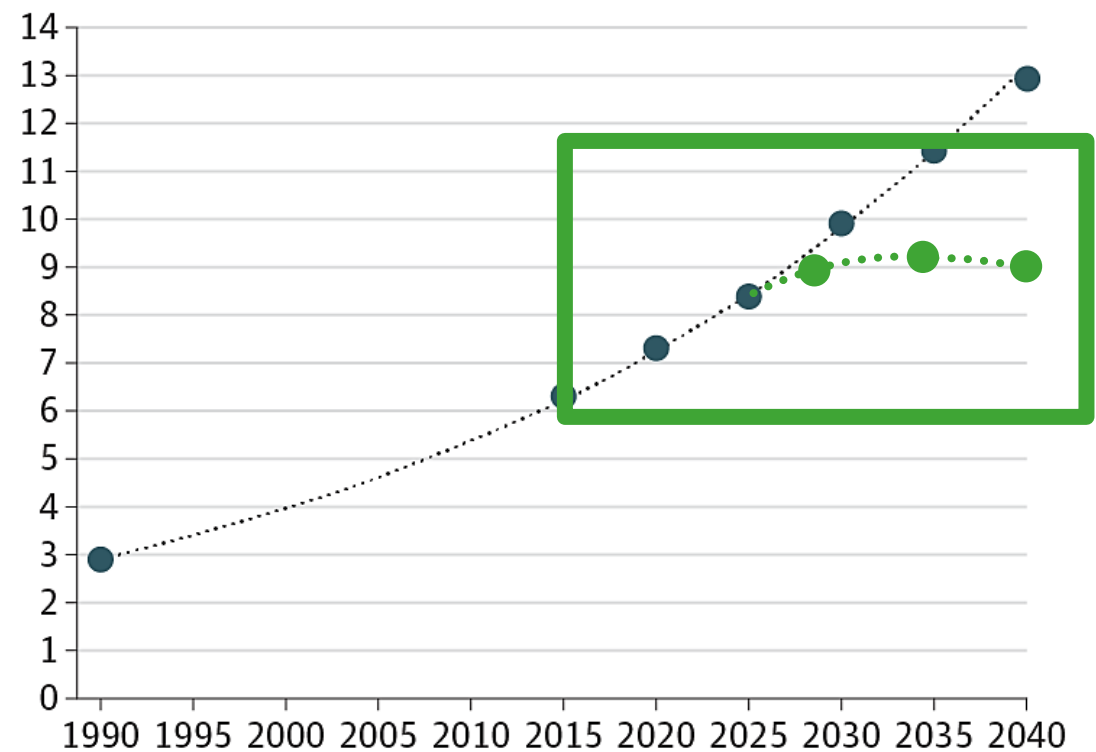
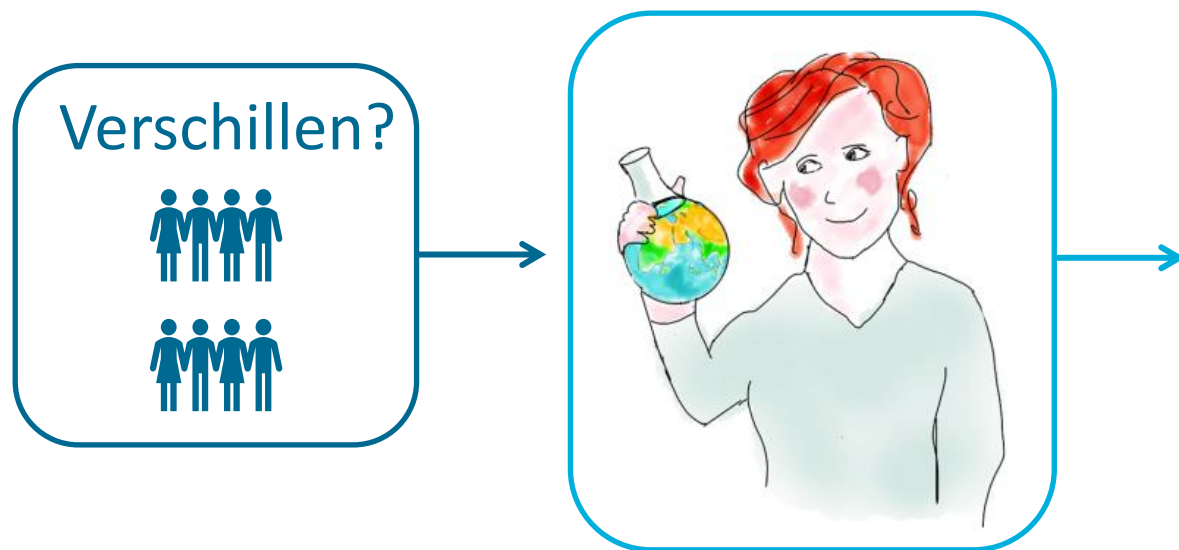






PD-PEST onderzoek







Effectiveness of home-based and remotely supervised aerobic exercise in Parkinson's disease: a double-blind, randomised controlled trial

Nicolien M van der Kolk, Nienke M de Vries, Roy P C Kessels, Hilde Joosten, Aeilko H Zwinderman, Bart Post, Bastiaan R Bloem

JAMA Neurology | Original Investigation

Effect of High-Intensity Treadmill Exercise on Motor Symptoms in Patients With De Novo Parkinson Disease A Phase 2 Randomized Clinical Trial

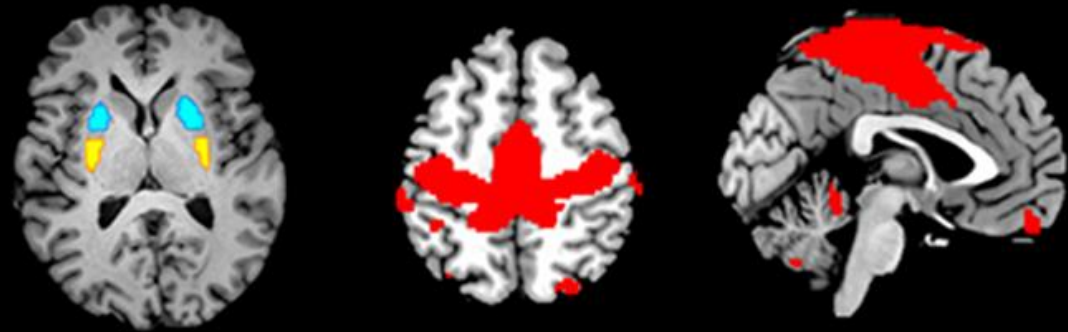
Margaret Schenkman, PhD, PT; Charity G. Moore, PhD; Wendy M. Kohrt, PhD; Deborah A. Hall, MD, PhD; Anthony Delitto, PhD, PT; Cynthia L. Comella, MD; Deborah A. Josbeno, PT, PhD; Cory L. Christiansen, PhD, PT; Brian D. Berman, MD, MS; Benzi M. Kluger, MD; Edward L. Melanson, PhD; Samay Jain, MD; Julie A. Robichaud, BS-PT, MHS, PhD; Cynthia Poon, PhD; Daniel M. Corcos, PhD

Van der Kolk et al. Lancet Neurol 2019
Schenkman et al. JAMA Neurol 2018

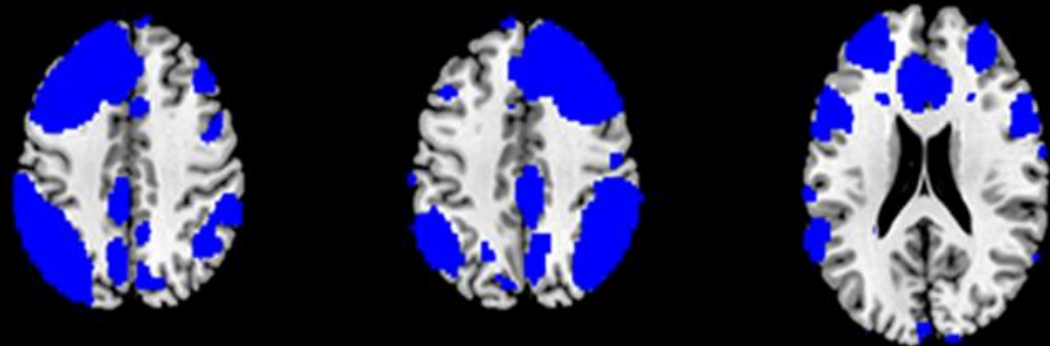


Park-In-Shape imaging study

Exercise stimulates
Cortico-Striatal Motor
Network Connectivity



Exercise stimulates
Cortico-Cortical
Cognitive Network
Connectivity



Johansson et al. Ann Neurol 2022



REPORT

Physical activity and risk of Parkinson's disease in the Swedish National March Cohort

Fei Yang,¹ Ylva Trolle Lagerros,² Rino Bellocco,^{1,3} Hans-Olov Adami,^{1,4} Fang Fang,¹ Nancy L. Pedersen^{1,5} and Karin Wirdefeldt^{1,6}

February 22, 2005; 64 (4) **ARTICLES**

Physical activity and the risk of Parkinson disease

H. Chen, S. M. Zhang, M. A. Schwarzschild, M. A. Hernán, A. Ascherio

First published February 22, 2005, DOI: <https://doi.org/10.1212/01.WNL.0000151960.28687.93>

Recreational physical activity and risk of Parkinson's disease

Evan L. Thacker SM✉, Honglei Chen MD, PhD, Alpa V. Patel PhD, Marjorie L. McCullough ScD, Eugenia E. Calle PhD, Michael J. Thun MD, Michael A. Schwarzschild MD, PhD, Alberto Ascherio MD, DrPH

First published: 25 January 2008 | <https://doi.org/10.1002/mds.21772> | Citations: 112

July 27, 2010; 75 (4) **ARTICLES**

Physical activities and future risk of Parkinson disease

Q. Xu, Y. Park, X. Huang, A. Hollenbeck, A. Blair, A. Schatzkin, H. Chen

First published July 26, 2010, DOI: <https://doi.org/10.1212/WNL.0b013e3181ea1597>

Physical activity and risk of Parkinson's disease and parkinsonism in a prospective population-based study (NEDICES)

Sara Llamas-Velasco^{a,b,*}, Israel Contador^c, Antonio Méndez-Guerrero^d, Carmen Romero Ferreiro^e, Julián Benito-León^{f,b}, Alberto Villarejo-Galende^{f,b}, Félix Bermejo-Pareja^{f,b}

Yang F et al. *Brain* 2015

Chen H et al. *Neurology* 2005

Xu Q et al. *Neurology* 2010

Thacker E et al. *Mov Disord* 2008

Llamas-Velasco S et al. *Prev Med Rep* 2021



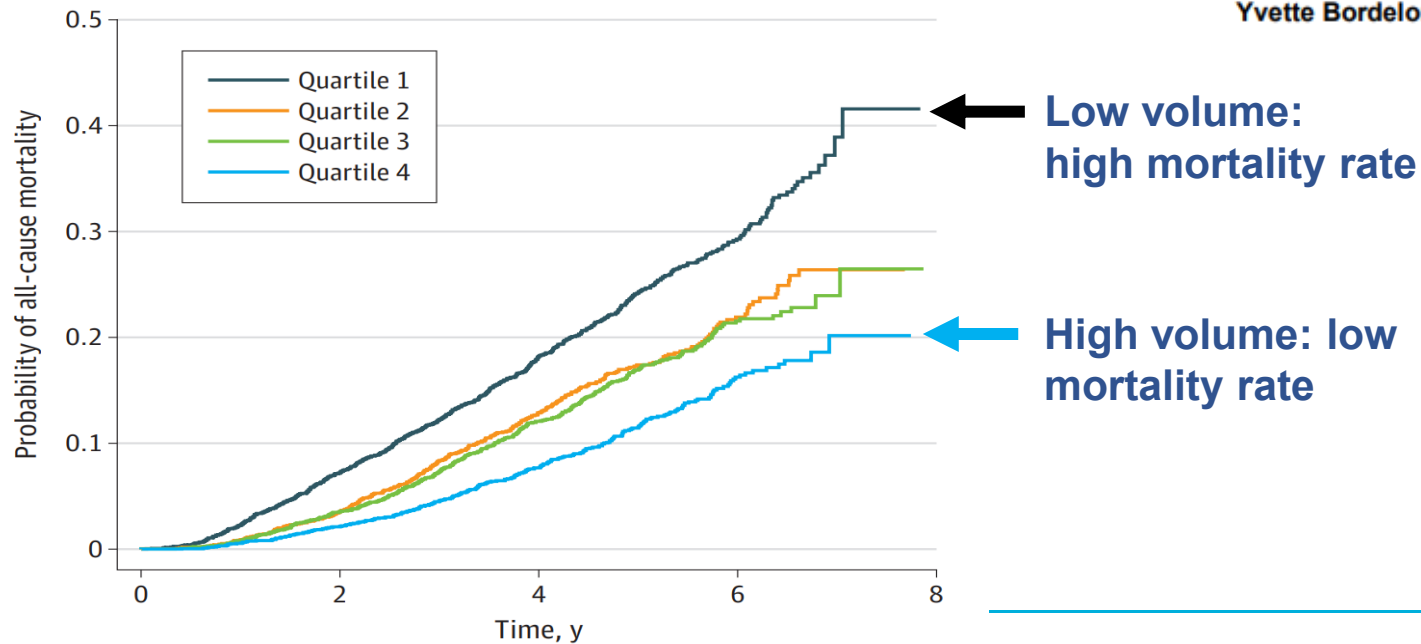
JAMA Neurology | Original Investigation

Association of Physical Activity, Including Amount and Maintenance, With All-Cause Mortality in Parkinson Disease

Seo Yeon Yoon, MD, PhD; Jee Hyun Suh, MD, PhD; Seung Nam Yang, MD, PhD; Kyungdo Han, PhD; Yong Wook Kim, MD, PhD

The Association Between Lifestyle Factors and Parkinson's Disease Progression and Mortality

Kimberly C. Paul, PhD¹, Yu-Hsuan Chuang, PhD¹, I-Fan Shih, PhD¹, Adrienne Keener, MD², Yvette Bordelon, MD, PhD², Jeff M. Bronstein, MD, PhD², and Beate Ritz, MD, PhD^{1,2,*}

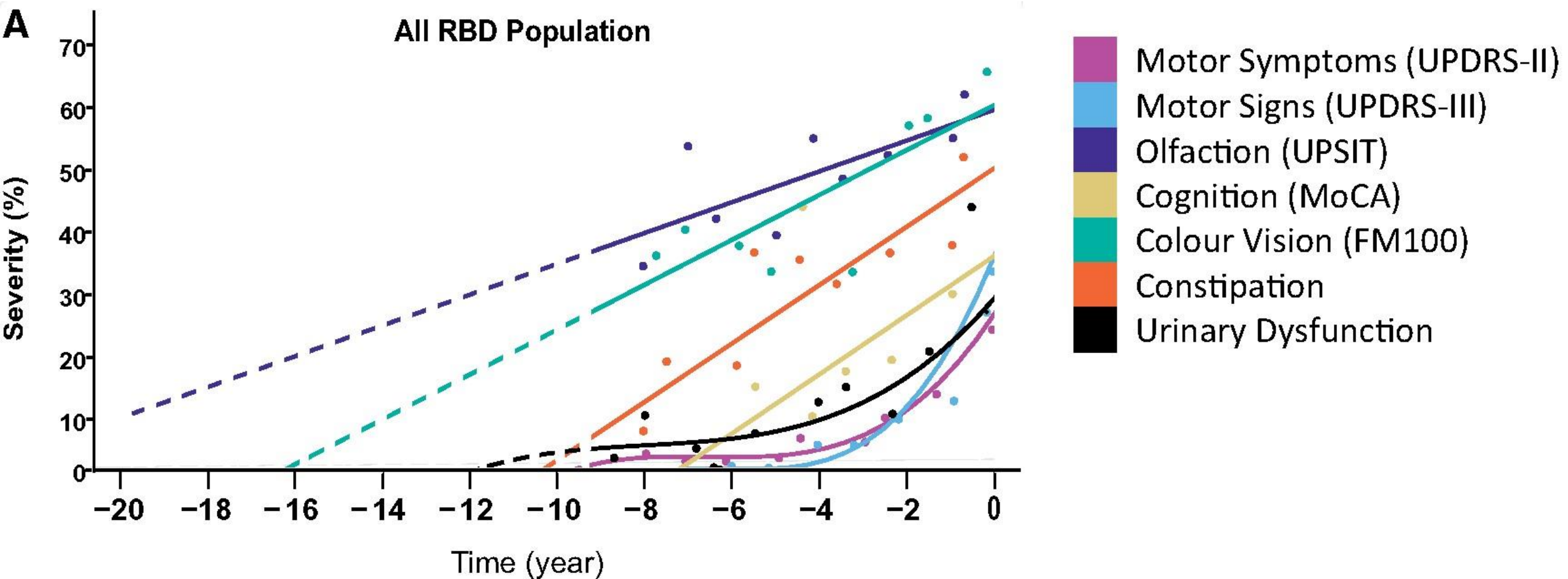


Yoon et al. JAMA Neurol 2021

Nog geen bewijs uit een trial!

Wie includeren in een preventie trial?

Prodromaal verloop RBD



Fereshtehnejad et al. Brain 2019.

Slow-SPEED: Slowing Parkinson's Early through Exercise

*1st prototype
trial of PD prevention*

*Gamified-enhanced
exercise RCT*

*Multiple years,
mostly remote*



*Slow-SPEED: **Slowing** Parkinson's Early through Exercise Dosage*



Slow-SPEED-NL



Slow-SPEED-UK



Slow-SPEED-US

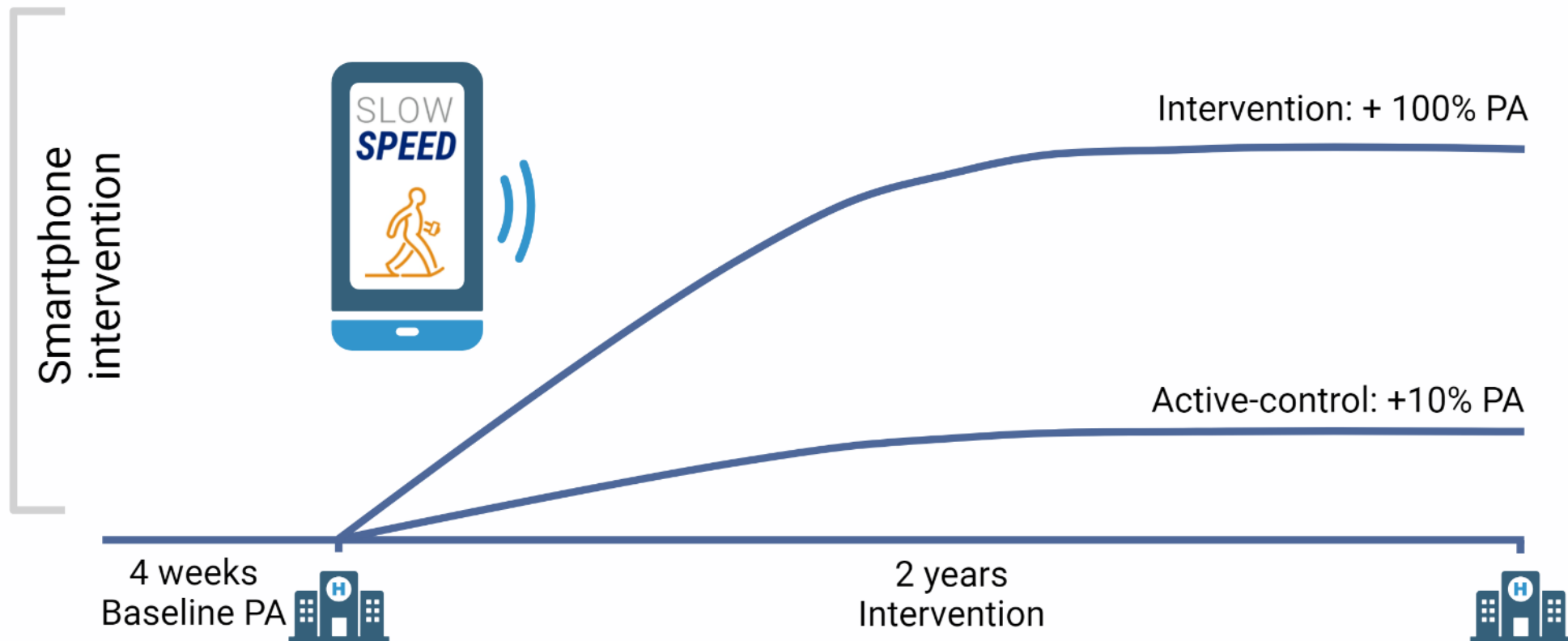


EU-expansion

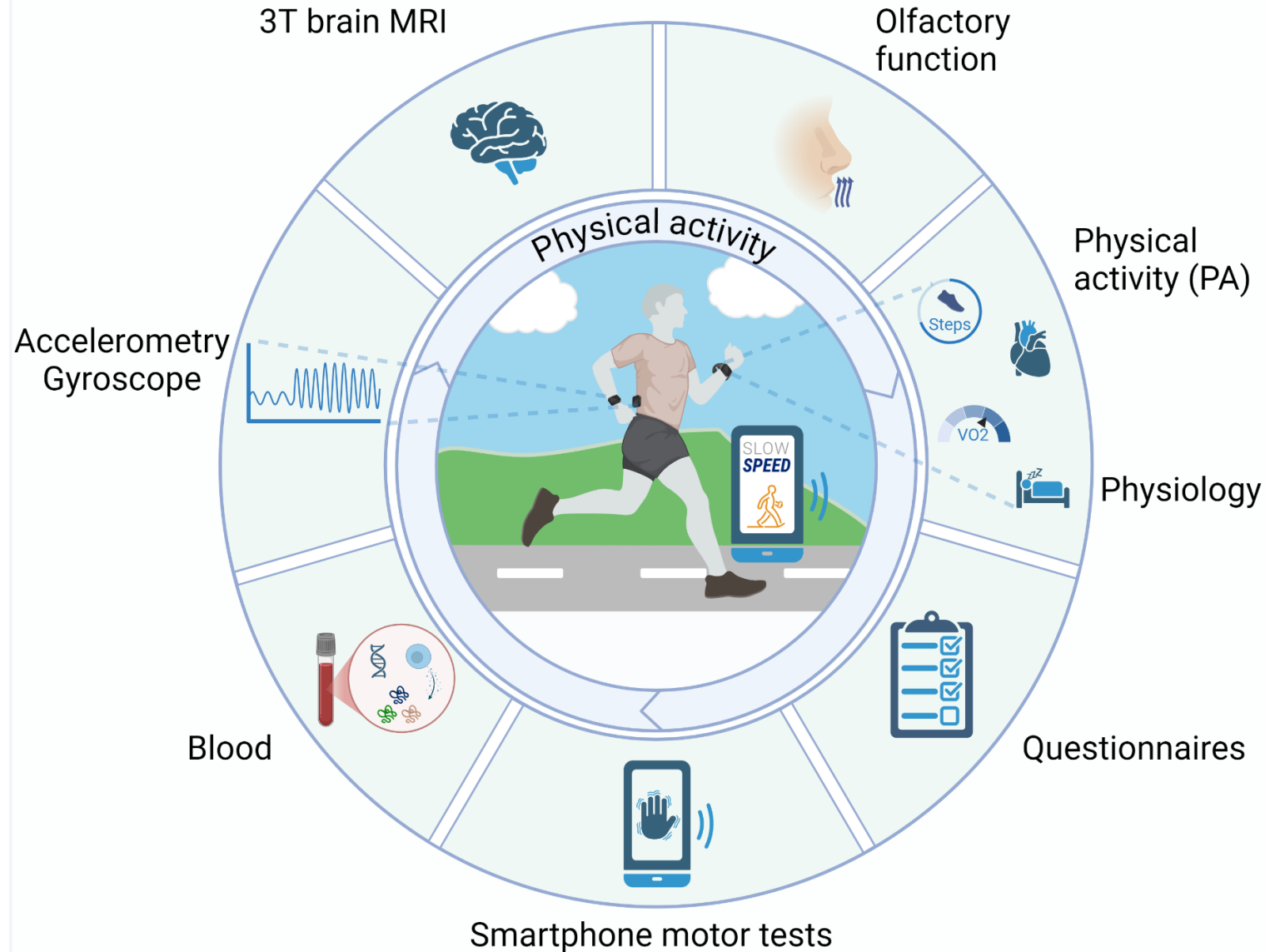
N participants	110	100	600	160 / 100
Duration	2 years	18 months	3 years	1 year
Study population	iRBD	hyposmia	LRRK2 or GBA1	iRBD / healthy controls
Treatment	Exercise	Exercise	Exercise	Exercise
Primary outcome(s)	Step count	Step count	Step count & prodromal load	Step count & cognition
Digital biomarkers	Yes	Yes	Yes	Yes
Blood biomarkers	Yes	No	No	Yes
Brain MRI	Yes	No	No	Yes

REM-slaap gedragsstoornis 50+ jaar

Protocol schematic



Assessment overview





SLOW
SPEED

