

WP4 Personalised exercise & nutrition interventions

WP4

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Aim of the WP

- 1 Map **lifestyle approaches per organ** via meta-analysis & re-analysis of existing data.
- 2 Validate exercise & nutrition strategies on **organ-specific ageing** using cohort and intervention data.
- 3 Measure intervention impact on WP2–3 biomarkers via **small-scale intervention studies**.
- 4 Build a **decision-making algorithm** for the right intervention, right person, biology & behaviour.

Scientific field & state of the art

Biological ageing is increasingly measurable *per organ system*, but lifestyle interventions are still mostly one-size-fits-all^{1,2}. WP4 seeks to create tailored, proven, lifestyle interventions to slow biological ageing.

TODAY

Generic guidelines; little organ-specific tailoring; intervention data sits in silos.

EMERGING

Biological-age & organ-specific clocks (WP2–3) maturing into responsive markers.

WP4 CONTRIBUTION

Evidence pipeline → intervention proof-of-concept → decision algorithm.

Gut–brain

Cardiometabolic

Skeletal–muscle

3 organ systems

Knowledge, expertise & skills

DOMAIN

Exercise physiology
Nutrition & health
Biological ageing & clocks
Behaviour change (via WP1)

METHOD

RCT design & conduct
Meta-analysis & epidemiology
Cohort & trial re-analysis
Data science & statistics



1 PostDoc & 2 PhDs
sector-plan PostDoc

Tools

Meta-analysis pipeline

Lifestyle × organ system; harmonised effects.

Cohort /RCT re-analysis

Harmonised datasets; biological-age outcomes.

Small-scale trials

Interventions at VU, WUR & HVA.

Wearables / biomarkers

Field measurement via WP6; lab biomarker panels.

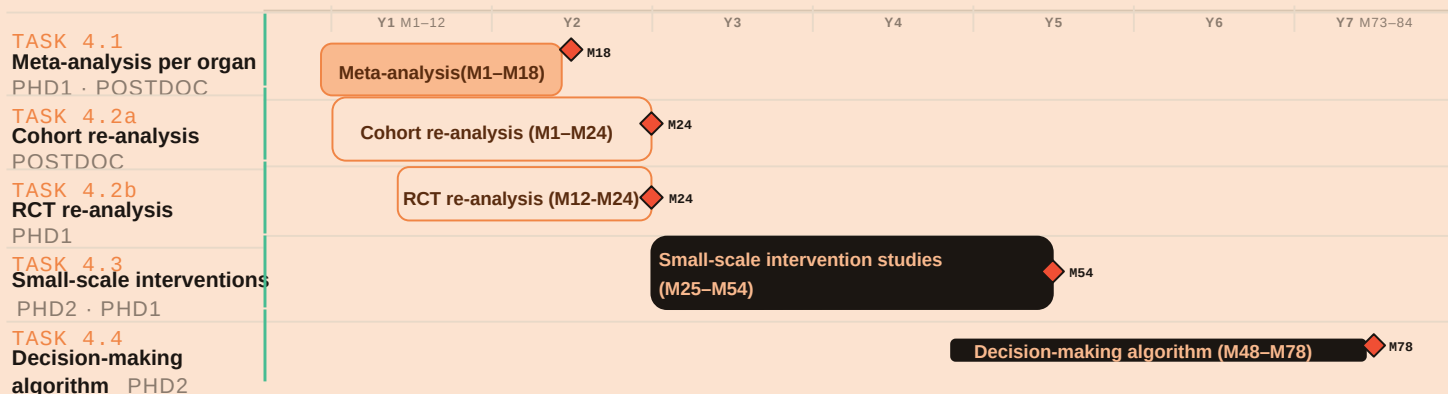
Decision algorithm

Biology + behaviour → personalised plan.

Trial infrastructure

Recruitment, randomisation & follow-up.

Expected output & deliverables — Year 1–7



Collaboration & interaction with other WPs

WHAT WP4 NEEDS • YEAR 1–7

1 WP1 Behaviour change

we need →
Behaviour-change insights to embed in our interventions.

2 WP2 Biomarkers

we need →
Biomarker set & organ systems. Join forces on T2.1 (population-level associations).

3 WP3 Validity

we need →
Early direction on biomarkers + live updates.

5 WP5 Implementation

we need →
Regular talks to stay within implementable boundaries & co-shape the trial.

6 WP6 Enablers

we need →
Cohorts & data-science capacity. Wearables to test in interventions.

Key stakeholders

Healthcare practitioners

dietitians, physiotherapists, GPs, future end-users of the algorithm.

Ageing adults

participants of the intervention trials; voice via WP5.

Other WPs

biomarker definitions & validation feed our analyses. Behaviour & implementation.

HVA • WUR • VU • UMCG • MUMC

host institutes, intervention infrastructure, data access, METC.

Key challenges

- **Dependency timing.** T4.1 depends on WP2 T2.1 & WP3 T3.1.
- **Biomarker direction early.** Need a working list of biomarkers & organs at start — not after publication.
- **From signal to prescription.** Translating biological-age changes into actionable, organ-specific lifestyle advice.
- **METC & trial logistics.** Approvals, recruitment and follow-up across three sites and two PhDs. With limited budget.
- **Implementable boundaries.** Keep the algorithm usable in real practice: stay close to WP5.

Refs

¹Loughlin KN, Grootswagers P, Camps G, de Groot LC. Perspective: Biomarkers of Aging in Human Nutrition Research—A Focus on Applications, Challenges, and Opportunities. *Adv Nutr.* 2025 PMID: 40738225
²Rutledge J, Oh H, Wyss-Coray T. Measuring biological age using omics data. *Nat Rev Genet.* 2022 Dec;23(12):715–727. doi: 10.1038/s41576-022-00511-7. Epub 2022 Jun 17. PMID: 35715611; PMCID: PMC10048602.



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