Novel Empowering Solutions And Technologies for Older People to Retain Everyday Life Activities:

«NESTORE – ein europäisches Forschungsprojekt zu einem digitalen Gesundheitscoach.

Oder: Datenerhebung in Zeiten von Corona»

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Outline

1. Background, Main Project Scope & Goals

2. NESTORE System & Coaching Domains

3. NESTORE e-Coaching & Behavior Change

4. Testing the System & the Intervention: Pilot Study
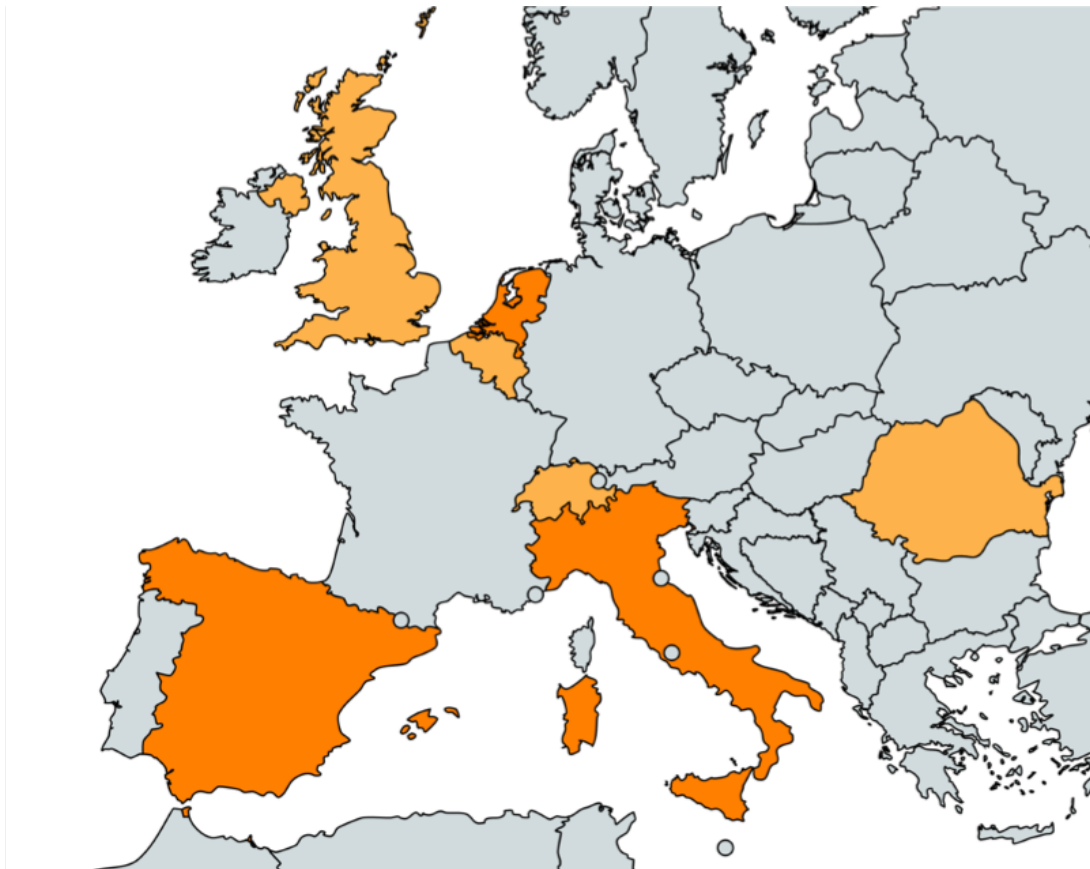
Background, Main Project Scope & Goals

The NESTORE Consortium

Coordinator

POLITECNICO MILANO 1863

Research

Consiglio Nazionale delle Ricerche

Hes·so Haute Ecole Spécialisée de Suisse occidentale

UNIVERSITAT DE BARCELONA

Fundació Salut i Envelliment UAB

Sheffield Hallam University

Universität Zürich UZH

TUDelft

Loughborough University

Industrial

eurecat Centre Tecnològic de Catalunya

RO PARDO

Neosperience

flex

Societal

AGE Platform Europe

LA MERIDIANA

hoogendoorn growth management
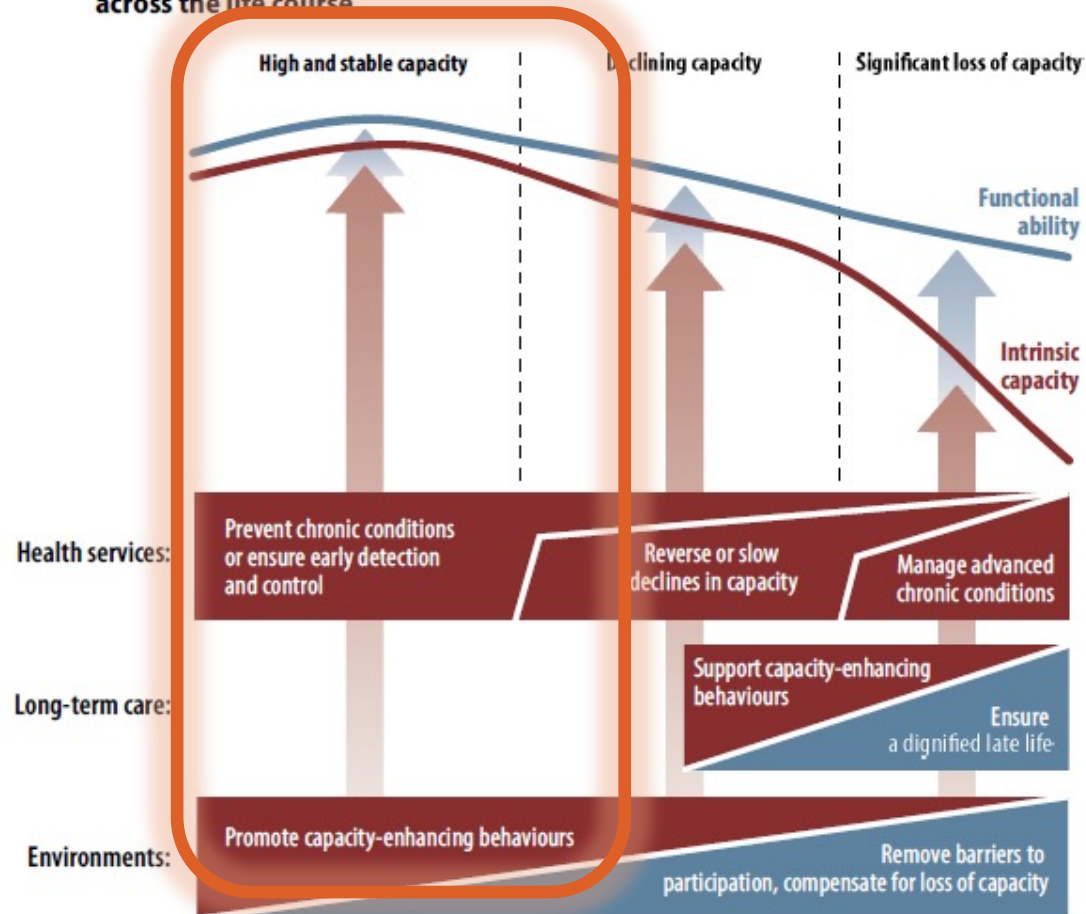
A Short Introduction to NESTORE Part 1

We all need a bit of support sometimes...
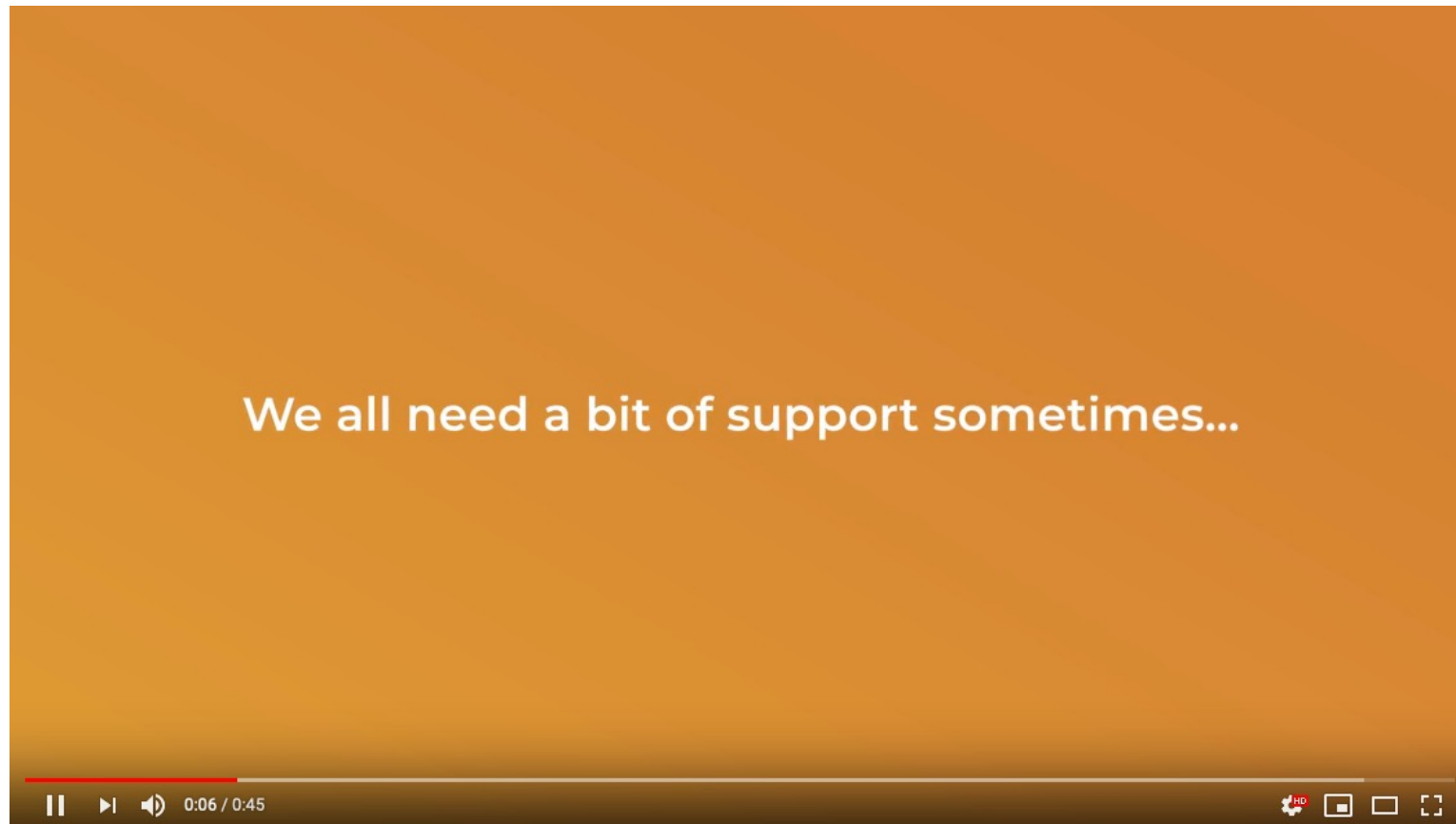
NESTORE Focus:
Supporting the Maintenance of Well-Being and Health

Fig. 2.4. A public-health framework for *Healthy Ageing*: opportunities for public-health action across the life course

WHO (2015)

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NESTORE Vision

➢ **Virtual Coach** as a **Companion**

➢ **Individualized** recommendations based on within-person daily life data

➢ **Multi-domain** scope

➢ **Participatory** co-development of technical system and coaching pathways

➢ Easily implementable coaching activities to fit a person's **daily life routines**

Brose & Ebner-Priemer (2015); Moller et al., 2017; Trull & Ebner-Priemer (2013); Yardley, Choudhury, Patrick, & Michie (2016)

NESTΩRE

YOUR WISE **COMPANION**

YOUR PATHWAY TO WELLBEING

NESTORE is your companion. It will educate you in staying active and healthy to ensure you sustain your quality of life as the years go by.

NESTORE will act on your motivation as well as empower you in your daily activities as it provides you with support and coaching in a life-long learning approach.

NESTORE operates into both physical and virtual domains through tangible objects (such as sensors) and software. These two domains will enable NESTORE to monitor and give advice in various dimensions of human life

▶ Physiological status and physical activity
▶ Nutrition
▶ Mental and physiological wellbeing
▶ Social interaction
▶ Cognitive capabilities

NESTORE Co-Creation / Co-Design Approach:
Exhibition-in-a-box Methodology
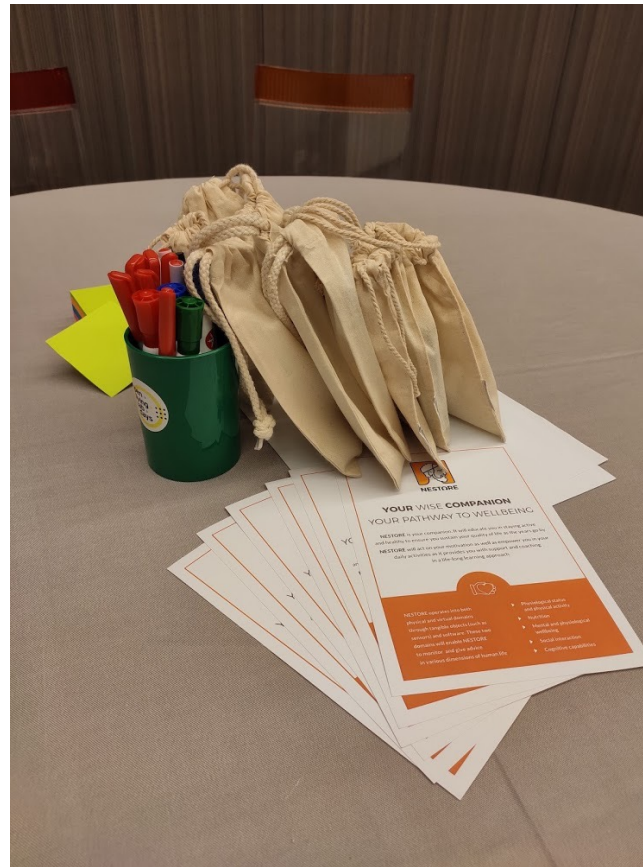
NESTORE System & Coaching Domains

NESTORE Components

1. NESTORE Coach

2. NESTORE Devices

3. Monitoring

Tangible ("The Coach")

Chatbot (incl. food tracking)

App (Smartphone / Tablet)

Wearable (Social Sensing Wristband for user and for network, accelerometer)

Serious Game

Bed Sensor

4. Data Integration

5. Decision Support System
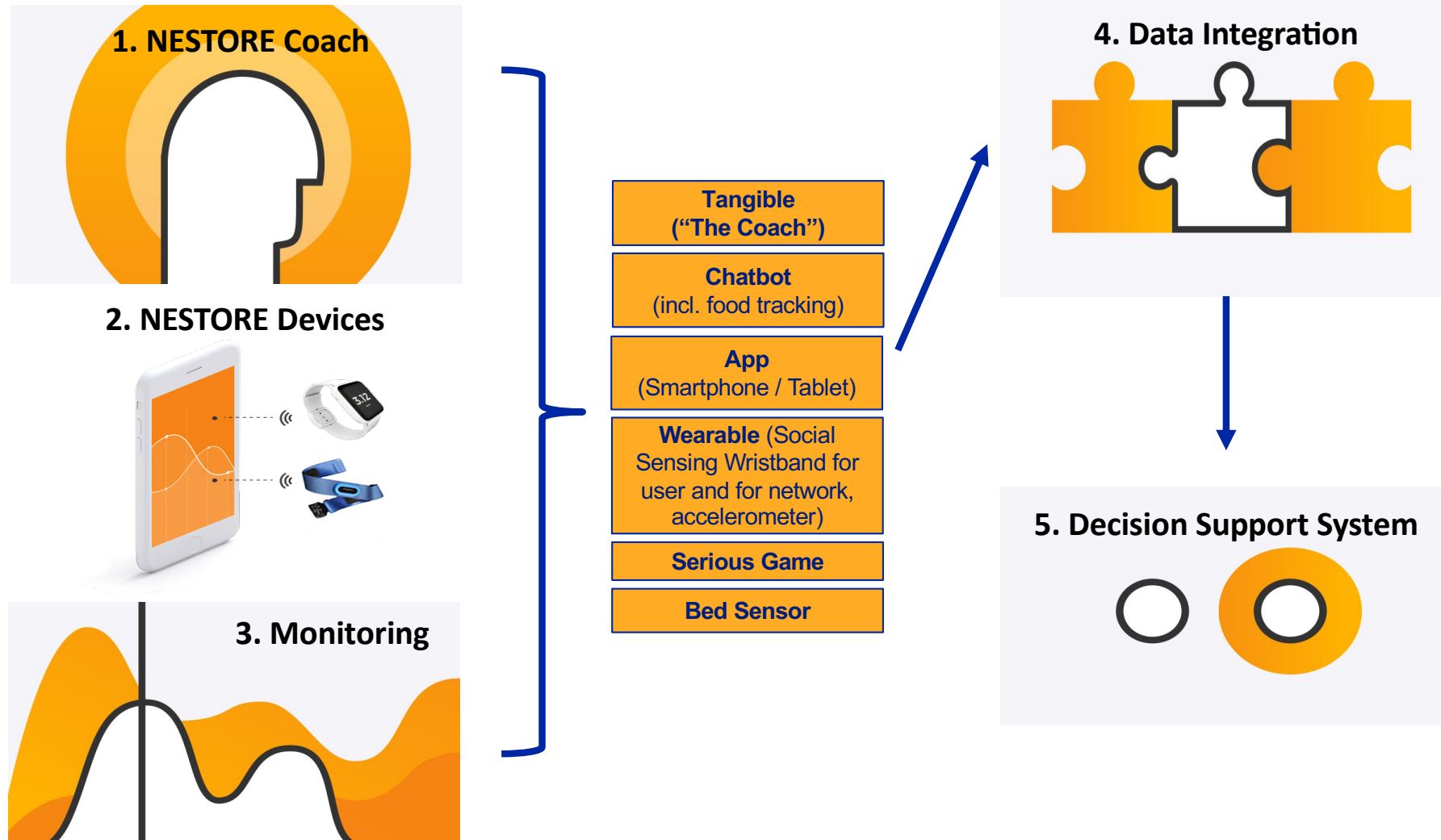
NESTORE „Well-Being" Domains: Multi-Domain Scope & Approach

Physical Activity & Physiology

Nutrition

Cognition

Social Relations

Subjective Well-Being
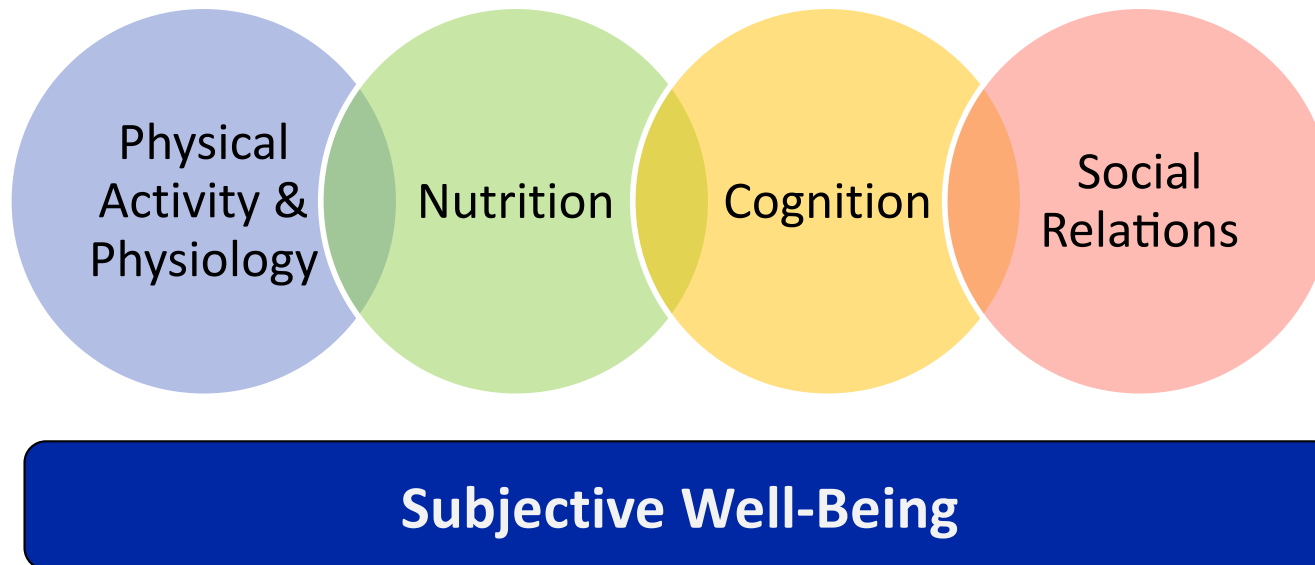
Focus on Cognition and Social Domains

Domain Expertise in Aging in Psychological Domains:
1st main UZH role

Physical Activity & Physiology

Nutrition

COGNITION

SOCIAL RELATIONS

Subjective Well-Being (ESM) & Emotion Detection from Text
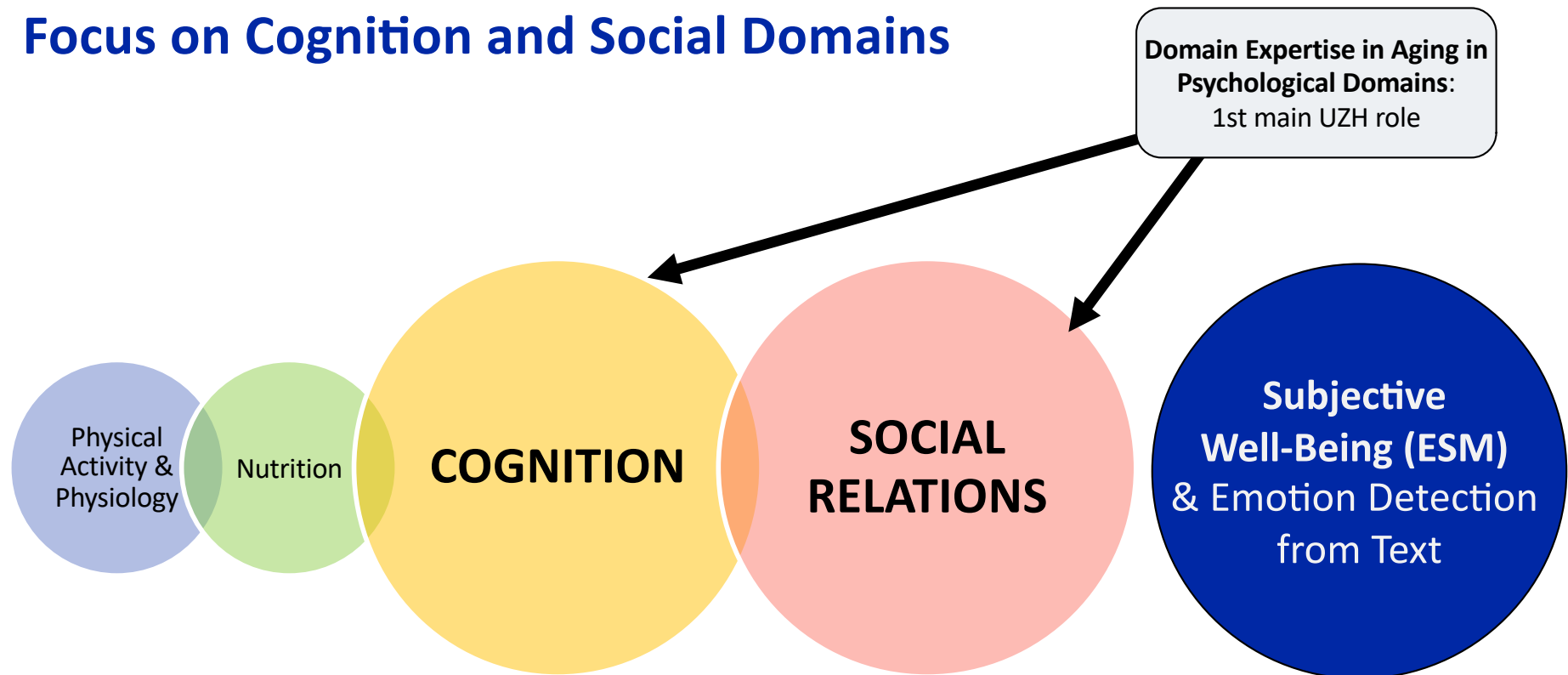
Core Tasks & Contributions

- Domain Description & Empirical Background and Findings

- Domain Operationalization for Status & Dynamical Assessment

- Intervention Identification & Development

Coaching in the Cognitive and Social Domains

COGNITION

SOCIAL RELATIONS

1. **Traditional** Cognitive Training Interventions
2. **Video Game** Training Interventions
3. **Productive Intellectual Engagement** Interventions

1. Increase opportunities for **social contact** („Befriending")
2. Improve **social skills**
3. Enhance social support & address maladaptive social cognition

1. **Working Memory** Training (numerical updating)
2. **Multi-Domain Serious Game** (based on Hotel Plastisse, Binder et al., 2015)
3. **Unstructured leisure activities** („learn a complex new skill")

1. **Join a (new) group activity**
2. Practice communication skills (e.g., conversational skills via phone or internet, compliments, handling silence)

Basak et al. (2008); Green & Bavelier (2007); Guye et al. (2016)
Noice & Noice (2009); Park et al. (2011)

Fokkema & van Tilburg (2007); Kremers et al. (2006);
Masi et al. (2011)

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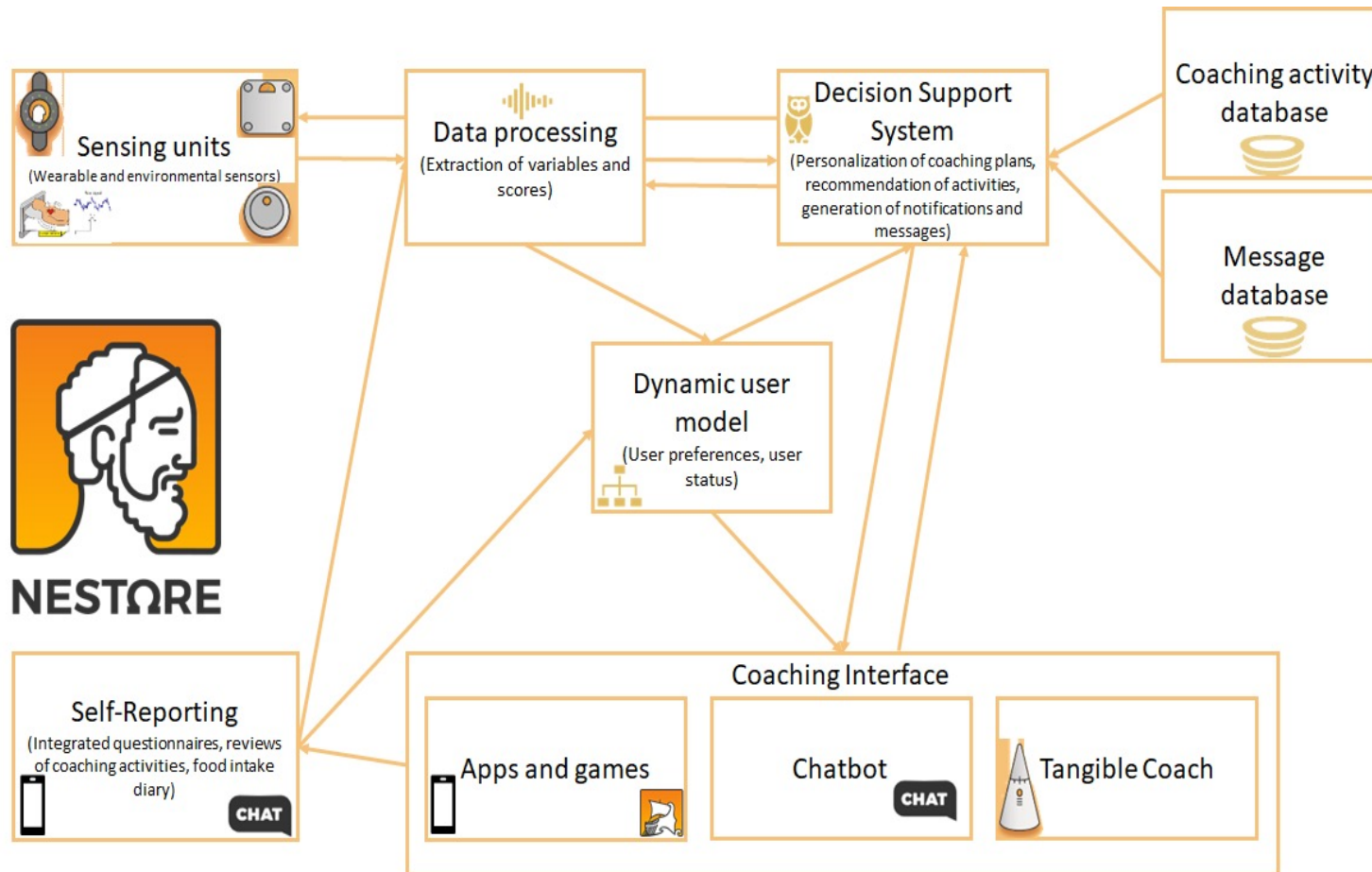
NESTORE e-Coaching & Behavior Change

NESTORE e-Coaching Architecture

Angelini, Mugellini, Khaled, Röcke, Guye, Porcelli, Mastropietro, Rizzo, Boqué, del Bas, Subias, Orte, & Andreoni (2019). Proceedings of ACM PErvasive Technologies Related to Assistive Environments (PETRA'19). ACM, New York, NY, USA.

NESTORE
Decision Support System

Silvia Orte[1], Paula Subías-Beltrán[1], Eloisa Vargiu[1], Alfonso Mastropietro[2], Giovanna Rizzo[2], Giorgio Manferdelli[2], Simone Porcelli[2], Filippo Palumbo[3], Lucía Tarro[4,5], Noemí Boqué[4], Josep Maria del Bas[4], Sabrina Guye[6], and Christina Röcke[6]

| From global recommendations (e.g., by the WHO) | → | General goals ("I want to stay cognitively healthy") | → | Specific activities ("play serious game 3x / week", "begin a foreign language class") |
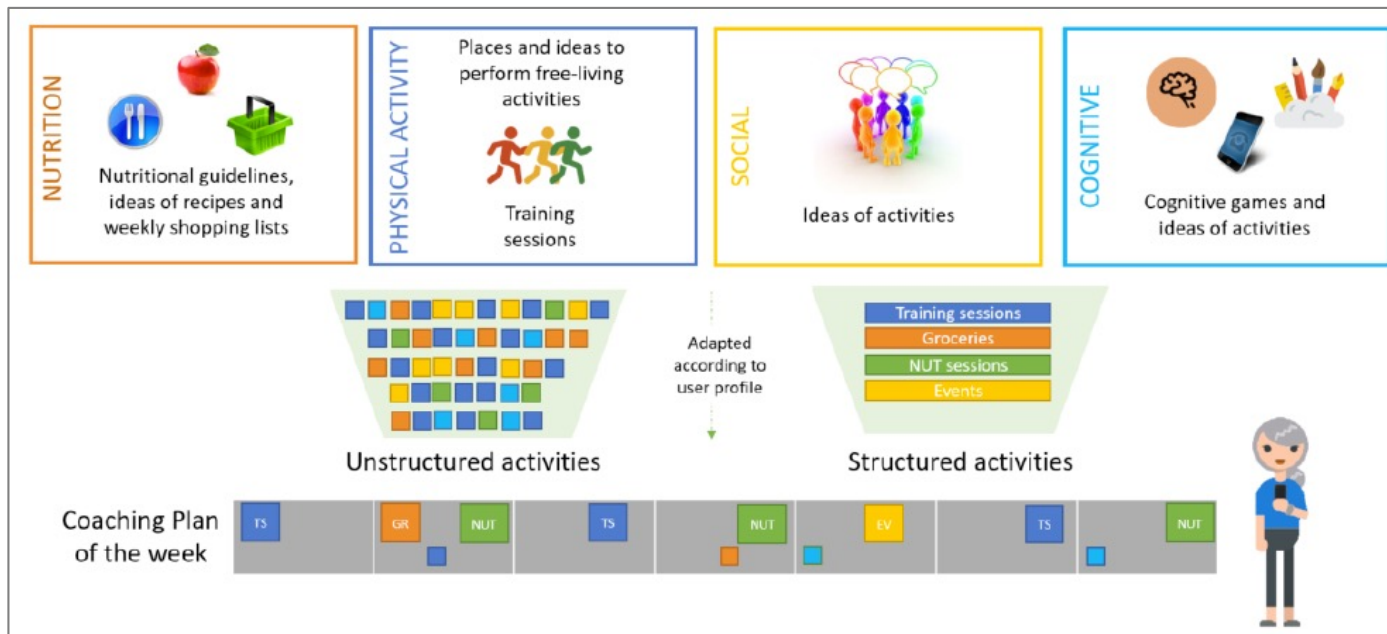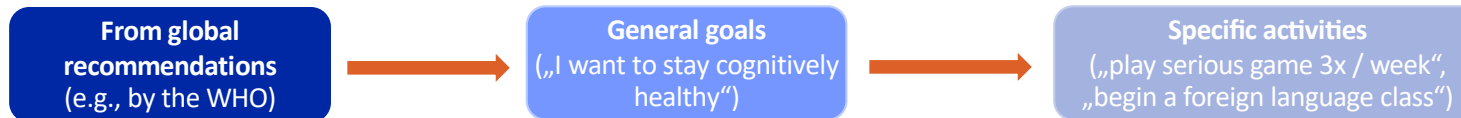
Coaching plans: Set of personalized recommendations based on behavioral analysis of trends and preferences of individual.

Coaching events: Set of activities to help users carry out coaching plans

(structured & unstructured)

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Behavior Change: Theoretical Framework

Behavior Change and Intervention Framework: 2nd main UZH Role

Motivational Self-Efficacy

Recovery Self-Efficacy

Outcome Expectancy

Intention

Behavior

Action Control

Risk Awareness

Action & Coping Planning
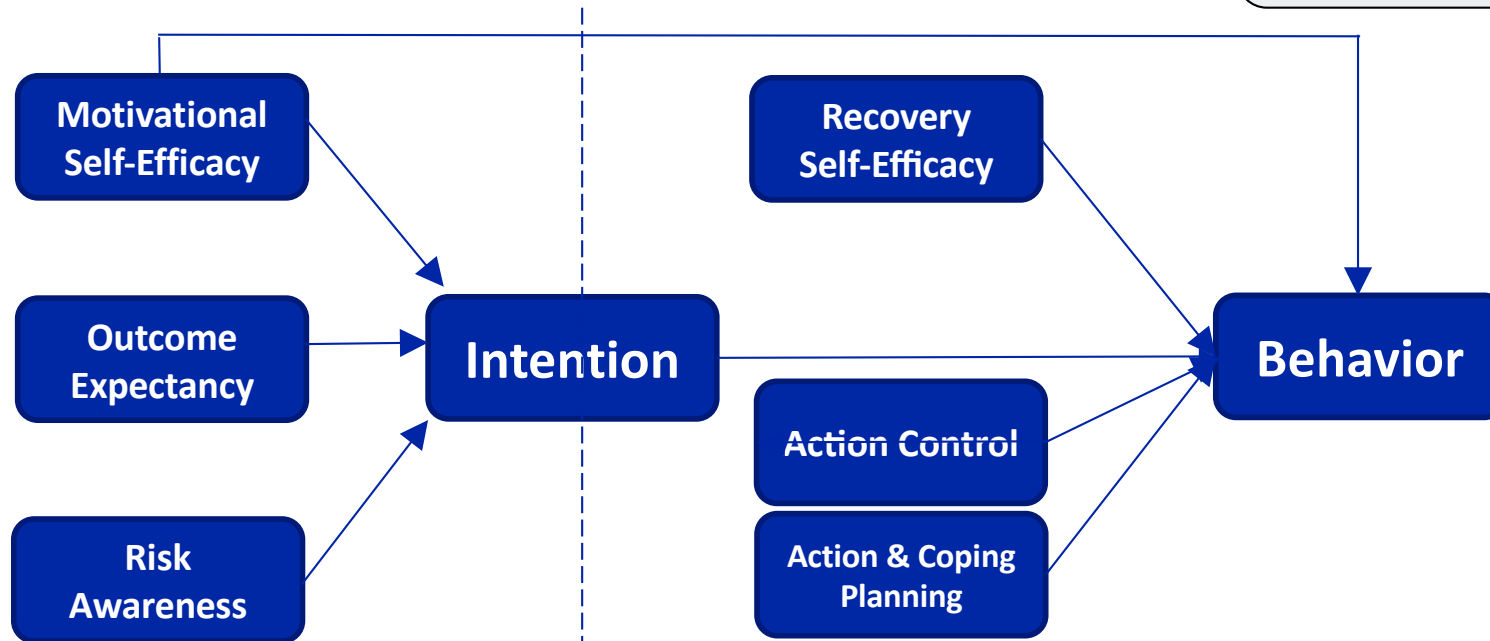
MOTIVATIONAL PHASE

VOLITIONAL PHASE

Pre-intenders

Intenders

Actors

Bierbauer et al. (2017)
Schwarzer (2008)
Schwarzer et al. (2007)

The Health Action Process Approach (HAPA)

Integrating Health Behavior Change Models and Behavior Change Techniques

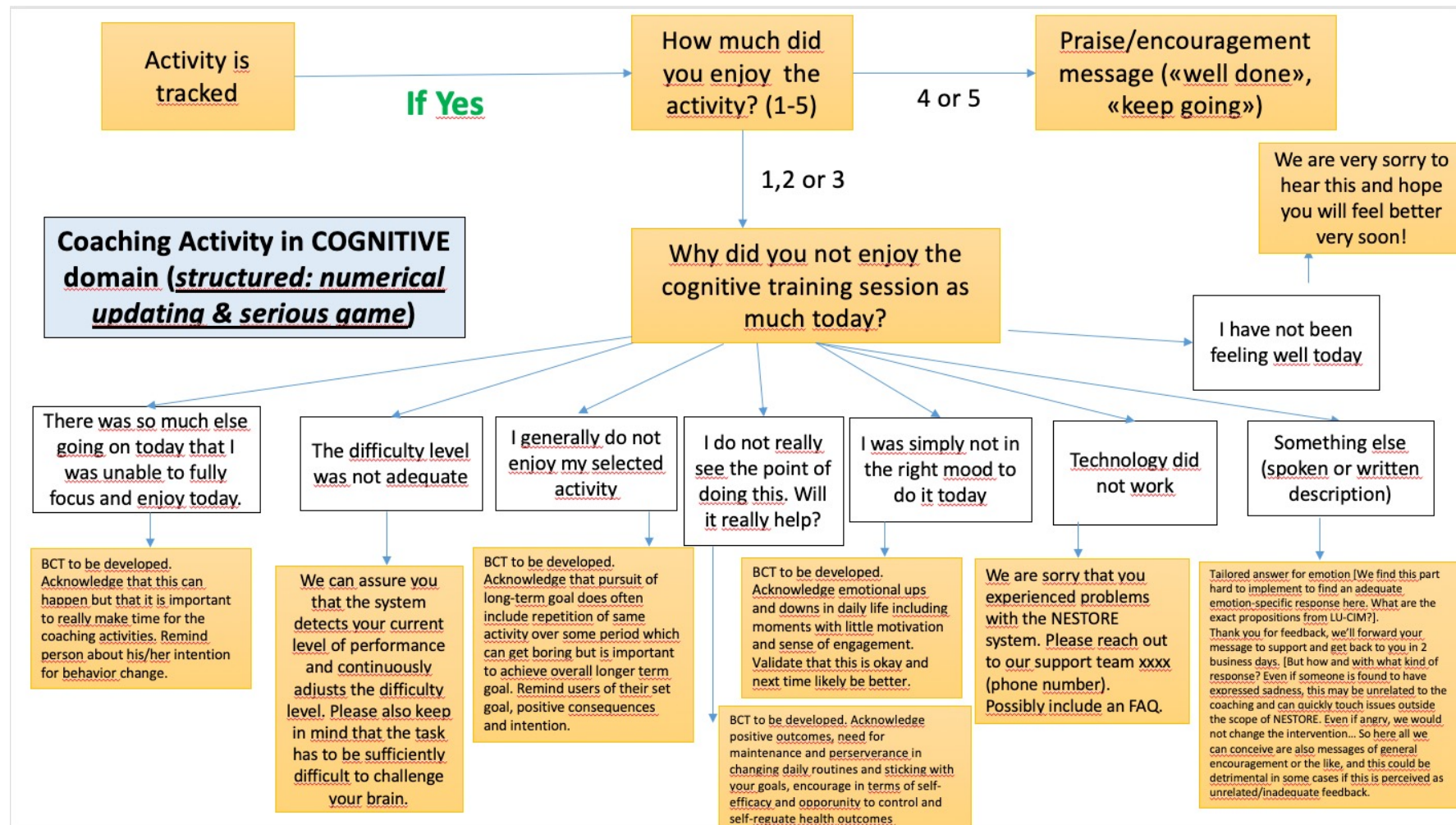| PHASE-SPECIFIC PREDICTOR VARIABLES	EXEMPLARY ITEM FOR ASSESSMENT (IN DAILY LIFE)	CORRESPONDING BEHAVIOUR CHANGE TECHNIQUES (BCT)
PHASE 1: MOTIVATIONAL PHASE		
Risk Awareness	If I am not regularly physically active, the probability is high that I will have serious health problems.	• Educational messages, provide information about health consequences, • self-monitoring • provide feedback • social comparison
Positive Expecta...		• Educational messages, provide information about health consequences • provide general encouragement
Motivat...		• Educational messages, provide information about health consequences • provide general encouragement • self-monitoring
Behavio...		• Behavioural contract
PHASE 2		
Recover...		• Provide general encouragement • prompt review of behavioural goals (plans for overcoming barriers and also regarding the personal goals) • stress management
Action Planning	I have made detailed plans for when and how I will be regularly physically active in the next four weeks.	• Calendar scheduling • set graded tasks • social support/social comparison for planning (ideas) • time management
Coping Planning	I have made a detailed plan regarding what to do if something interferes with my plans	• Prompt barrier identification, problem solving
Action Control: (1) Awareness of Standards (2) Self-Monitoring (3) Self-Regulatory Effort	(1) During the last 4 weeks, I was always aware of my intended training program. (2) During the last 4 weeks, I constantly monitored whether I was as physically active as I had planned. (3) During the last 4 weeks, I always tried to be as physically active as I had intended.	(1) Prompt review of behavioural goals, educational messages, self-tracking, model/demonstrate behaviour, instruction (2) Self-monitoring, provide feedback (3) Provide general encouragement, self-monitoring / review of performed activities, prompts/reminders (of plans to overcome problems and of goals)

Callout box:
- ➢ **Educational messages**
- ➢ **Calendar scheduling / planning**
- ➢ **Self-monitoring**
- ➢ **Reminders and prompts**
- ➢ **(Personalized) feedback**
- ➢ **Praise and encouragement**

Abraham & Michie (2008); Arnautovska et al. (2017); Michie, Abraham et al. (2009); Muellmann et al. (2018); Roberts et al. (2017); Sullivan & Lachman (2017)

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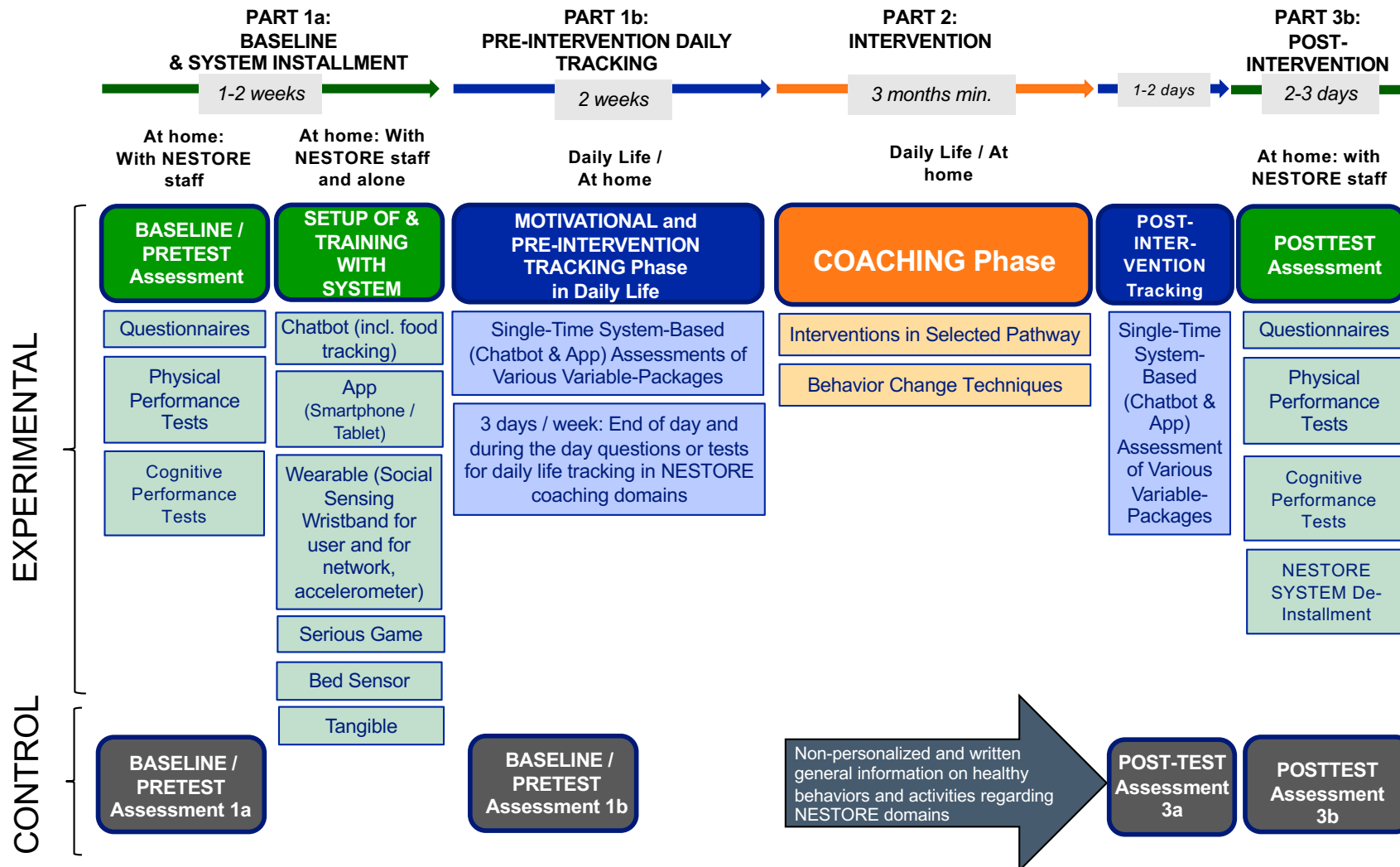# Activity Review & Just-in-Time Behavior Change Techniques

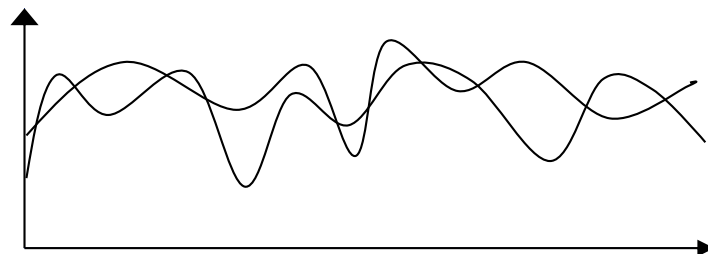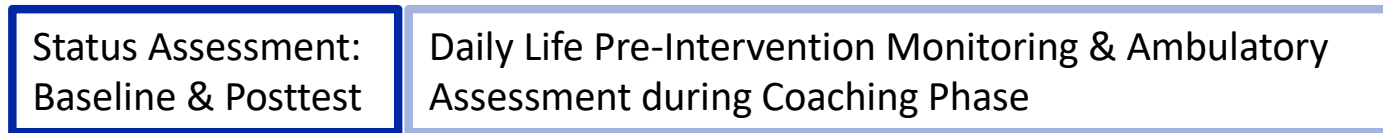# Testing the System and the Intervention: Pilot Study

Pilot Study Across Three Countries

Pilot Study Design and Protocol:
3rd key UZH Role

PART 1a: BASELINE & SYSTEM INSTALLMENT	PART 1b: PRE-INTERVENTION DAILY TRACKING	PART 2: INTERVENTION		PART 3b: POST-INTERVENTION
1-2 weeks	*2 weeks*	*3 months min.*	*1-2 days*	*2-3 days*

| At home: With NESTORE staff | At home: With NESTORE staff and alone | Daily Life / At home | Daily Life / At home | | At home: with NESTORE staff |

EXPERIMENTAL

BASELINE / PRETEST Assessment	SETUP OF & TRAINING WITH SYSTEM	MOTIVATIONAL and PRE-INTERVENTION TRACKING Phase in Daily Life	COACHING Phase	POST-INTER-VENTION Tracking	POSTTEST Assessment
Questionnaires	Chatbot (incl. food tracking)	Single-Time System-Based (Chatbot & App) Assessments of Various Variable-Packages	Interventions in Selected Pathway	Single-Time System-Based (Chatbot & App) Assessment of Various Variable-Packages	Questionnaires
Physical Performance Tests	App (Smartphone / Tablet)	3 days / week: End of day and during the day questions or tests for daily life tracking in NESTORE coaching domains	Behavior Change Techniques		Physical Performance Tests
Cognitive Performance Tests	Wearable (Social Sensing Wristband for user and for network, accelerometer)				Cognitive Performance Tests
	Serious Game				NESTORE SYSTEM De-Installment
	Bed Sensor				
	Tangible				

CONTROL

BASELINE / PRETEST Assessment 1a	BASELINE / PRETEST Assessment 1b	Non-personalized and written general information on healthy behaviors and activities regarding NESTORE domains	POST-TEST Assessment 3a	POSTTEST Assessment 3b

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Available Data in Social, Cognitive and Well-Being Domains

Status Assessment: Baseline & Posttest	Daily Life Pre-Intervention Monitoring & Ambulatory Assessment during Coaching Phase

Subjective Well-Being	Daily Positive & Negative Affect	Discrete Positive and Negative Emotions	Sentiment Detection (from Text Samples)

Baseline & Posttest Transfer Task Performance	Daily Working Memory (Digit Span)	Daily Memory Failures	Training Task Performance

Social Integration and Loneliness	Daily Social Integration & Interaction	Daily Social & Emotional Loneliness	Daily Social Interaction Sensing (Beacons)

Rich within-person daily life experience and performance data that can be linked to pre-to-post multi-domain training intervention results

Individualized, conceptually and empirically-derived health intervention for healthy older adults

3-4 months

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Und dann kam die COVID19-Pandemie und Lockdowns…

Datenerhebungen hatten im Februar 2020 gestartet
(nach jeweils erfolgreichem Ethikantrag) … und mussten dann unterbrochen und im Sommer 2020 fortgesetzt werden …

Table 1. Cases recruited by site

	Control		Intervention		Total	
	n	Column %	n	Column %	n	Column %
Site						
Total	13	100.0%	33	100.0%	46	100.0%
Barcelona	10	76.9%	22	66.7%	32	69.6%
Milan	0	0.0%	3	9.1%	3	6.5%
Rotterdam	3	23.1%	8	24.2%	11	23.9%

Geplant waren …
3 x n = 30 Intervention Group
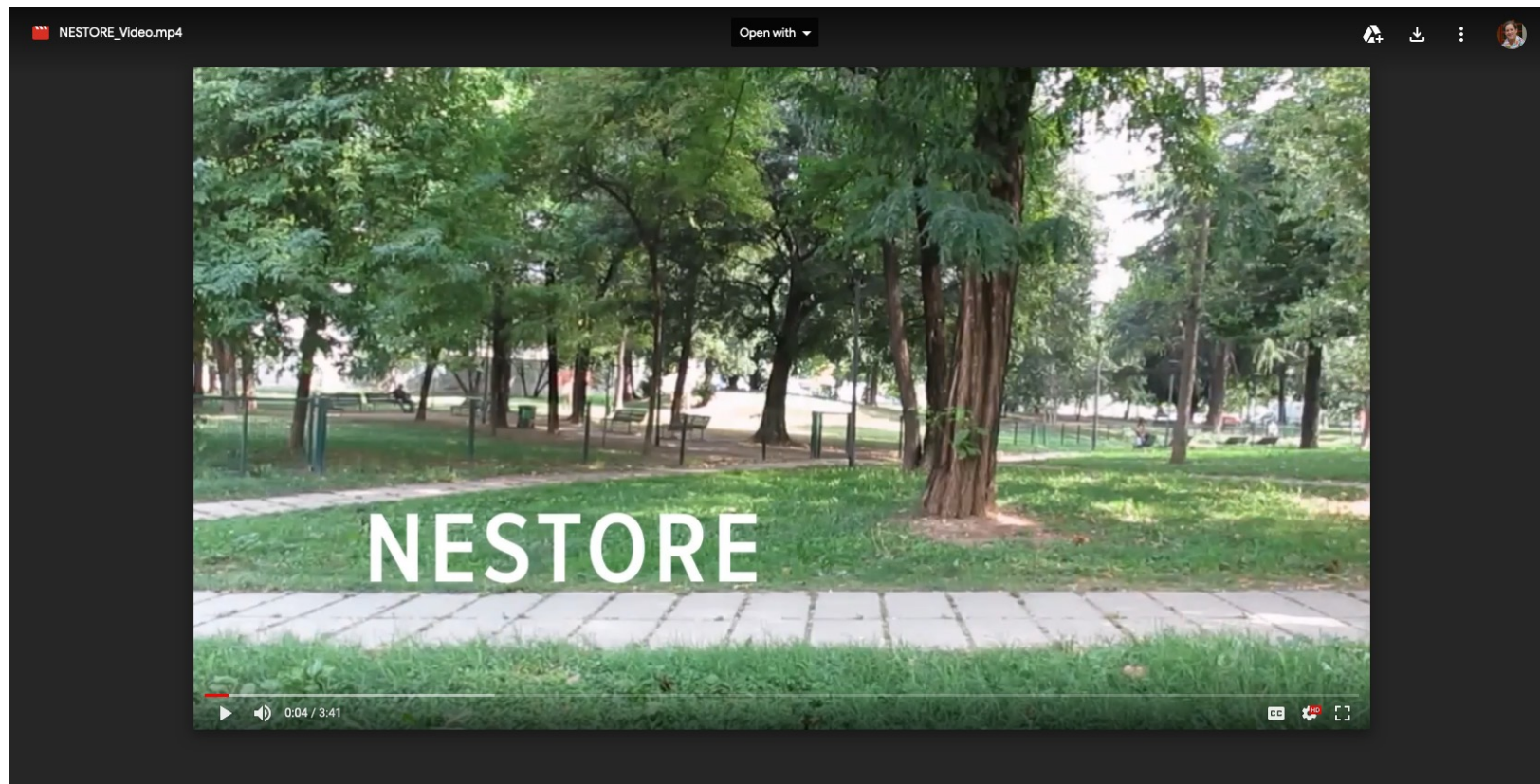3 x n = 10 Control Group

Alter: M = 70.20 (SD = 3.45)
Frauen: 53.3%
Bildung: 40% Universitätsabschluss, 56% Höherer sekundärer Bildungsgrad
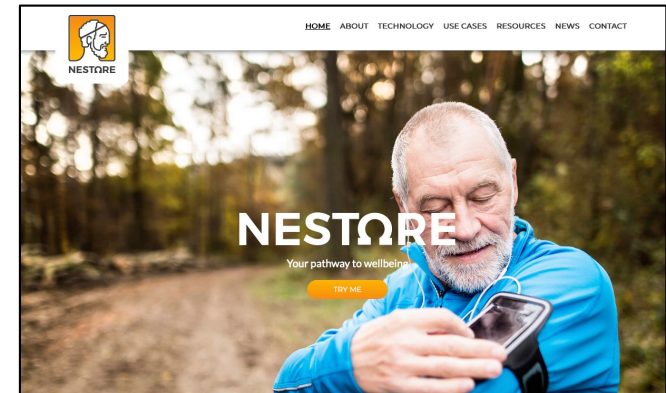
NESTORE Summary Part 2

Thank you very much for your attention

NESTORE Plenary Meeting Barcelona 2018

MORE INFORMATION:
https://nestore-coach.eu/home