IOT PLATFORM FOR AGEING SOCIETY: THE SMART BEAR PROJECT

SMART BIG DATA PLATFORM TO OFFER EVIDENCE-BASED PERSONALISED SUPPORT FOR HEALTHY AND INDEPENDENT LIVING AT HOME

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San Raffaele Smarter and Healthier City in Milan
A Living Lab for Open Innovation in Health & Well-Being
Research Center Advanced Technologies in Health & Well-Being

Research Program

Smart\textit{er} & Health\textit{ier} City

Smart\textit{er} & Health\textit{ier} Life

Smart\textit{er} & Saf\textit{er} Hospital

European Network of Living Labs
Healthcare 4.0

Social, Service and Process Robotics & IoT

Smart\textit{er} & Health\textit{i}er City

- Healthcare Process Re-engineering
- Social & Cognitive
- Surgical
- Rehabilitative
- Exoschelectric
- Dro(ne)botics
- Nanobotics
- Assistive
- Architectural

Smart\textit{er} & Health\textit{i}er Life

Smart\textit{er} & Health\textit{i}er Hospital
To implement and test state of the art technology in the senior’s everyday life in order to enhance their wellbeing.

The aim is to promote individual's awareness and motivation for behavioural change. Using Communication and Information Technologies to help citizen to make healthier, greener and fairer choices according to user’s needs and preferences. SMART BEAR project is focused on disease prevention and well-being promotion.

Smart er & Healthier Life

Funded by the European commission

Call: “Trusted digital solutions and Cybersecurity in Health and Care”

INTRODUCTION
INTRODUCTION

WHO (2014): “Ageing well” must be a priority

“Unless health systems find effective strategies to address the problems faced by an ageing world population, the growing burden of chronic disease will greatly affect the quality of life of older people.”
INTRODUCTION

SMART BEAR targets **people over 65** to implement:

**Management of chronic medical conditions**
- Enhance **self-awareness** on the users’ **health status**
- Support the **self-management** of the users’ **health conditions**
- Enable evidence-based support for **clinicians’ decision making**

**Healthy ageing**
- Promote **active living** (physically and cognitively)
- Encourage **healthy habits** (socialization and nutrition)
- Provide conditions that facilitate **safe, independent living**
RATIONALE

HEALTHY AGEING

Low probability of disease and disease-related disability

High cognitive and physical functional capacity

Active engagement with life

## PILOT SITES

### Table:

<table>
<thead>
<tr>
<th>Pilot Sites</th>
<th>Sample Population</th>
<th>Sample Size</th>
<th>Geographic Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>Independent older adults living at home/</td>
<td>1000</td>
<td>Region of Peloponnese, Municipality of Palaio Faliro</td>
</tr>
<tr>
<td></td>
<td>Older adults living in collective structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy-Portugal</td>
<td>Independent older adults living at home/</td>
<td>1100</td>
<td>Milan metropolitan city, District of Crema, Madeira Island</td>
</tr>
<tr>
<td></td>
<td>Older adults living in collective structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Independent older adults living at home/</td>
<td>1000</td>
<td>Ile-de-France (Paris Region), Nouvelle Aquitaine and Bretagne</td>
</tr>
<tr>
<td></td>
<td>Older adults living in collective structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>Independent older adults living at home/</td>
<td>1000</td>
<td>Barcelona, Madrid, Sevilla areas, Pais Vasco, Galicia and Balearic Island</td>
</tr>
<tr>
<td></td>
<td>Older adults living in collective structures</td>
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</tr>
<tr>
<td>Romania</td>
<td>Independent older adults living at home/</td>
<td>1000</td>
<td>Bucharest, Cluj Napoca and Constanta metropolitan areas</td>
</tr>
<tr>
<td></td>
<td>Older adults living in collective structures</td>
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</tr>
</tbody>
</table>

5 Pilots with 5100 participants over 65
"Smart Big Data Platform to Offer Evidence-based Personalised Support for Healthy and Independent Living at Home"
"Smart Big Data Platform to Offer Evidence-based Personalised Support for Healthy and Independent Living at Home"

Internet of Medical Things

- Mobile technology
- Health wearables
- Medical sensor devices
- Smart speakers
- Smart home devices

- Time spent using the platform...
- Heart rate, respiration rate...
- Glycaemia, blood pressure...
- Surrounding noise...
- Home temperature, humidity...
SMART BEAR PERSONAL DEVICES

SMART BEAR DEVICES AND CLOUD SYSTEM
## SMART BEAR PERSONAL DEVICES

### Smartphone (Samsung Galaxy S10)

### Parameters

<table>
<thead>
<tr>
<th>Device</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonak Marvel-50</td>
<td>Duration of active use (hours or minutes)</td>
</tr>
<tr>
<td></td>
<td>Average duration of active use per day (hours or minutes)</td>
</tr>
<tr>
<td></td>
<td>Duration of exposure at environmental noise levels per day and per week (minutes)</td>
</tr>
<tr>
<td></td>
<td>Percentage of active use in soft/medium/high intensity sounds (percentage)</td>
</tr>
<tr>
<td>Body+</td>
<td>Body weight (kilogram or pound)</td>
</tr>
<tr>
<td></td>
<td>Body muscle mass (kilogram or pound)</td>
</tr>
<tr>
<td></td>
<td>Body bone mass (kilogram or pound)</td>
</tr>
<tr>
<td></td>
<td>Body fat mass (kilogram or pound)</td>
</tr>
<tr>
<td></td>
<td>Body fat free mass (kilogram or pound)</td>
</tr>
<tr>
<td></td>
<td>Body fat ratio (percentage)</td>
</tr>
<tr>
<td>BPM Core</td>
<td>Diastolic Blood Pressure (mmHg)</td>
</tr>
<tr>
<td></td>
<td>Systolic Blood Pressure (mmHg)</td>
</tr>
<tr>
<td></td>
<td>Heart Rate (beats per minute)</td>
</tr>
<tr>
<td></td>
<td>ECG signal (μV, time series)</td>
</tr>
<tr>
<td>Thermo</td>
<td>Body Temperature (Celsius or Fahrenheit)</td>
</tr>
<tr>
<td></td>
<td>Skin Temperature (Celsius or Fahrenheit)</td>
</tr>
<tr>
<td>iHealth Air</td>
<td>Blood oxygen saturation (percentage)</td>
</tr>
<tr>
<td></td>
<td>Pulse rate (beats per minute)</td>
</tr>
<tr>
<td></td>
<td>Number of steps (dimensionless number)</td>
</tr>
<tr>
<td></td>
<td>Distance traveled (meters)</td>
</tr>
<tr>
<td></td>
<td>Calories burned through activity (kCal)</td>
</tr>
<tr>
<td></td>
<td>Calories burned by Basal Metabolic Rate (kCal)</td>
</tr>
<tr>
<td></td>
<td>Intensity Minutes (minutes)</td>
</tr>
<tr>
<td></td>
<td>Duration of vigorous/moderate/low activity (seconds)</td>
</tr>
<tr>
<td></td>
<td>Floors climbed (dimensionless number)</td>
</tr>
<tr>
<td></td>
<td>Average heart rate on last 7 days (beats per minute)</td>
</tr>
<tr>
<td></td>
<td>Average heart rate at rest (beats per minute)</td>
</tr>
<tr>
<td></td>
<td>Sleep quality (label)</td>
</tr>
<tr>
<td></td>
<td>Sleep duration (seconds)</td>
</tr>
<tr>
<td></td>
<td>Time spent in deep/light/REM sleep (seconds)</td>
</tr>
</tbody>
</table>

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### Smart Scale (Body+)

### Smart Health Monitor (Thermo)

### Smart Hearing Aids (Phonak Marvel 50)

### Smart Blood Pressure (BPM core)

### Smart Oximeter (iHealth air)

### Smart-watch (Garmin VivoSport)
SMART BEAR PERSONAL HOME DEVICES

- Smartphone (Samsung Galaxy S10)
- Motion Sensor (Philips)
- Smart Bulbs (Philips)
- Aqara Temperature Device (Xiaomi)
SMART BEAR PERSONAL HOME DEVICES

SMART BEAR DEVICES AND CLOUD SYSTEM

16/07/2021

Motion Sensor (Philips)
Smart Bulbs (Philips)
Aqara Temperature Device (Xiaomi)

Device	Measurements
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Room Light Intensity [illuminance]
UV Index [integer]
Outdoor/Room Temperature [Celsius or Fahrenheit]
Outdoor/Room Relative Humidity [percentage]
Outdoor/Room Atmospheric pressure [hectoPascal]
Weather conditions (i.e. wind speed, wind direction, rain volume, snow volume and visibility)

SMART BEAR DEVICES AND CLOUD SYSTEM

16/07/2021

Smartphone
(Samsung Galaxy S10)
"Smart Big Data Platform to Offer Evidence-based Personalised Support for Healthy and Independent Living at Home”
"Smart Big Data Platform to Offer Evidence-based Personalised Support for Healthy and Independent Living at Home"
- Identify the profiles of different categories of users and characterize them (personas)
- Design the platform to meet each profile’s needs

**Carlo**
- Problems
  - Sedentary lifestyle
  - Bad diet habits
  - High blood pressure

**Lidia**
- Problems
  - Low mood
  - Memory and concentration difficulty
  - Hearing loss
  - Unhealthy environment
## SMART BEAR SCENARIOS & INTERVENTIONS

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Carlo (S1)</th>
<th>Lidia (S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1. Physical training</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I2. Diet plan</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I3. Monitoring of physiological parameters</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I4. Psychoeducational intervention</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I5. Monitoring of the mood</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I6. Cognitive training</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I7. Hearing training</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I8. Environment Monitoring and adjustment</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transversal functions</th>
<th>Carlo (S1)</th>
<th>Lidia (S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF1. Data visualization</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF2. Gamification</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF3. Regular report</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF4. Regular report to clinician</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF5. Suggestion</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF6. Reminder</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF7. Data access to caregiver</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TF8. Tele-consulting</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
SMART BEAR SCENARIOS & INTERVENTIONS: Carlo & Lidia

- Sedentary life: Physical activity plan
- Bad or poor diet: Diet plan
- High blood pressure: Blood pressure monitoring
- Low mood: Psychosocial and educational intervention
- Memory and attention difficulties: Cognitive training
- Hearing loss: Hearing training
- Unhealthy environment: Environmental monitoring

Visualization of the collected data
Incentives for a better compliance to the plan
Regular reports
Personalized tips and reminders
Access to data by a family member
Remote medical consultation
SMART BEAR PLATFORM

1. MyHeart
2. MyBalance
3. MyMood
4. MyDiary
5. MyDiet
6. MyHearing
7. MyMemory
8. MyMedication
9. MySmartbear
10. MyAppointments

CONCLUSIONS
ET SI VOUS PARTICIPIEZ ?

Bénéficiez chez vous gratuitement d’outils connectés pour votre bien-être et votre santé !

Nombre de places restantes 0982

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