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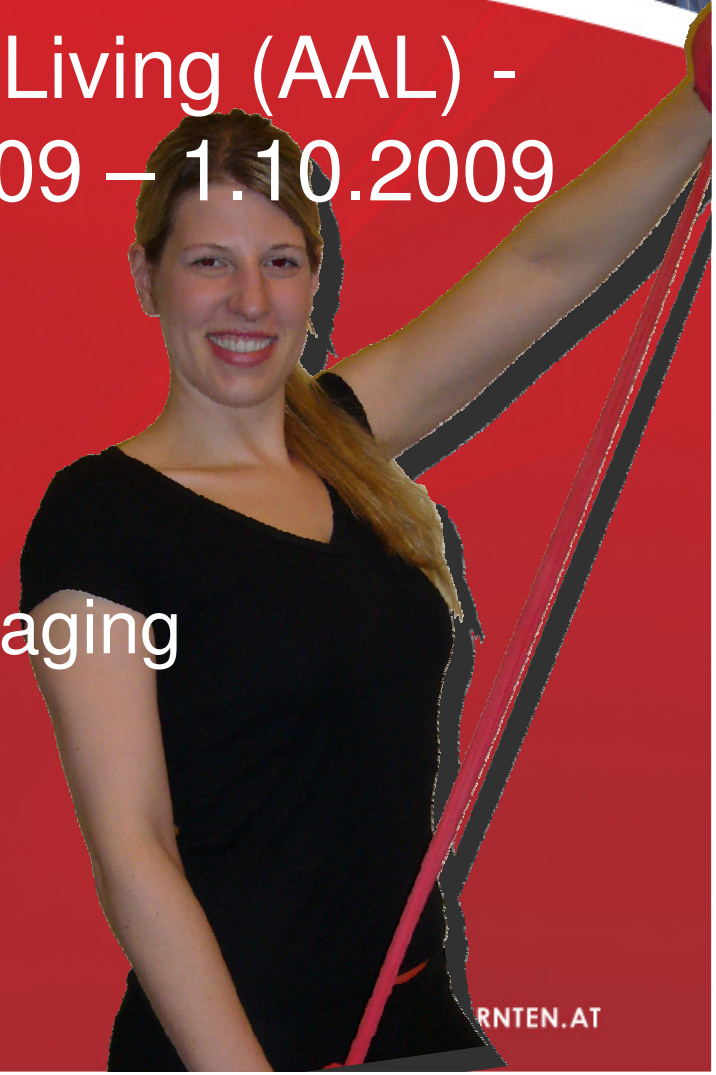
BMVIT - Ambient Assisted Living (AAL) -
FORUM '09 Vienna 28.9.2009 – 1.10.2009

# Health@Home

## Home-based exercise therapy – an important step towards healthy aging



**ProjectNr: 820967**
**3.te Ausschreibung des Benefit Programmes**

RNTEN.AT

# Introduction

- Project details
- Motivational aspects
- Cardiac rehabilitation
- Home based Training / Resistance Training
- Health@Home System overview
- Project milestones
- Training exercises
- Next steps and future perspectives

# Project Partners

**Project in the 3rd Call of the Benefit Program**

**Titel:** Heimbasiertes Krafttraining für ältere Personen als Fortsetzung der Herz-Kreislauf Rehabilitation

**ProjectNr:** 820967
**Begin:** 1.5.2009
**End:** 31.1.2012

- **FHK MedIT** — Fachhochschule Kärnten, Studienbereich Medizinische Informationstechnik
- **ZARG** — Zentrum für ambulante Rehabilitation Graz GmbH, Krankenanstalt für ambulante kardiologische Rehabilitation und Physiotherapie
- **Ilogs** — Information logistics GmbH
- **AIT** — Austrian Institute of Technology
- **Joanneum** — Institut für Nichtinvasive Diagnostik
- **UNIQA** — Uniqa - Vital Club

# Motivation



- Heart and Cardiovascular diseases are worldwide one of the most common cause of morbidity and mortality. In Austria the mortality of cardiovascular diseases is about 38 % . (Source: Statistics Austria)
- The World Health Organization (WHO) has defined cardiac rehabilitation as the "Sum of activity required to ensure cardiac patients the best possible physical, mental, and social conditions …"
- Structured, regular exercise sessions are the most important pillars to the prevention and rehabilitation of society's most widespread disease – metabolic syndrome[1] (Pedersen and Saltin)
- Continuous exercise and muscle development can reduce health problems -> Exercise is Medicine

Ambulante kardiologische Rehabilitation. HTA Projektbericht Nr. 15, 2009. Ludwig Bolzman Institut

[1] Metabolic syndrome is seen today as the deciding risk factor for coronary heart disease

# Rehabilitation Phases after Cardiologic Event

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According to the guidelines of the AUSTRIAN SOCIETY OF CARDIOLOGY (OKG)

**4-Steps Rehabilitation Model**

**PHASE I:** inpatient mobilization; designed primarily after an acute event

**PHASE II:** supervised residential or ambulant program; individually prescribed exercise with continuous or intermittent ECG monitoring, daily

**PHASE III:** long term ambulant program (6 – 24 month); includes clinical supervision and intermittent ECG and blood pressure measuring 2x per week

**PHASE IV:** **ongoing long- term program beyond phase III; generally does not include clinical supervision or ECG monitoring, 1x per week** !

# Status Quo of Cardiac Rehabilitation in Austria

- Currently in Austria about 9 institutes are practicing ambulant cardiac rehabilitation to provide services all over the country
- Institutes are accredited and have a contract according to the guidelines of the Austrian Society of Cardiology
- Institutes offer Phase II and Phase III rehabilitation
- Problems:
  - Too few institutes offering phase III, IV rehabilitation
  - Insufficient contingent
  - No nationwide offer

# Demand for in/out patients
# Cardiac Rehabilitation in Austria

| | Patients 2007 | Capacity of Rehabilitation 2007 | Clinical Need |
|---|---|---|---|
| Inpatient Phase I | 27.075 | - | - |
| Inpatient Phase II | 14.746 | 9 institutions | ~12000 |
| Outpatient Phase II | - | ~2500 | ~6000 |
| Outpatient Phase III | - | - | ~14000 |
| Phase IV | ? | ? | ? |

**Ambulante kardiologische Rehabilitation. HTA Projektbericht Nr. 15, 2009. Ludwig Bolzman Institut**

# Physical Activity Guidelines

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**Physical Activity:**
Consistently encourage patients to accumulate 30 – 60 minutes per day of moderate-intensity physical activity on < 5 (preferably most) day of the week.
Explore daily schedules to suggest how to incorporate increased activity into usual routine (e.g. Parking farther away from entrance, walking during lunch break)

**Exercise Training:**

For aerobic exercise:
Frequency: 3 - 5 days /week;
Intensity: 50 – 80 % of exercise capacity
Duration: 20 – 60 minutes
Method: walking, treadmill, cycling, rowing, stair climbing, etc

For resistance exercise:
Frequency: 2 – 3 days / week;
Intensity: 10 – 15 repetitions per set to moderate fatigue
Duration: 1 – 3 sets of 8 – 10 different upper und lower body exercise;
**Method: calisthenics, elastic bands, hand weights, wall pulleys, or weight machines .**

**Goal** → **DAILY Systematic TRAINING!**

**Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: 2007 Update: A Scientific Statement from the American Heart Association. Circulation 2007; 115:2575 – 2682.**

# Resistance Training

- Resistance Training can lead to an increase in muscle mass and / or improve coordination and metabolism.
- Based on its numerous health-promoting factors, moderate resistance training is recommended for persons of all ages as an important component of a comprehensive fitness program.
- In certain patient groups increasing muscle strength and function can lead to significant improvements in quality of life.
- Resistance exercises lead to a gradual improvement in coordination and balance. -> reduces the danger of falls!
- Resistance training positively influences bone density in both women and men.

Christodoulos A. D. Volakis K. A. Tokmakidis S. P. Neue Aspekte des Krafttrainings in der kardialen Rehabilitation. J Kardiol 2003. 10 (5): 207 - 13

Bjarnason-Wehrens B. Mayer-Berger W. Meister E. R. Baum K. Hambrecht R. Gielen S. Einsatz von Kraftausdauertraining und Muskelaufbautraining in der kardiologischen Rehabilitation. Empfehlung der Deutschen Gesellschaft für Prävention und Rehabilitation von Herz-Kreislauferkrankungen. Z Kardiol 2004; 93: 357 – 370

# Training Exercises at Home ?

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## Training Phase III/IV

- twice a week / one session per week
- about one year/ ongoing

## Training session example

- 30 min endurance cycle ergo meter training
- 25 min moderate physical training (resistance training, coordination training)


**HOME BASED TRAINING**
(Health@Home)

Goal

**Daily Training Phase III,IV**

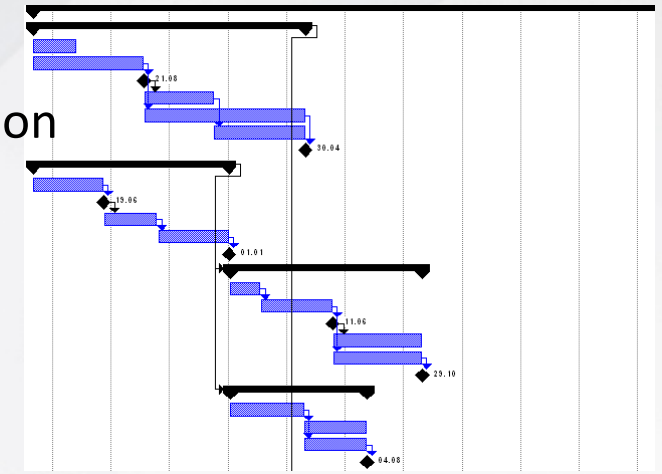
**Core Components of Cardiac Rehabilitation/Secondary Prevention Programs: 2007 Update: A Scientific Statement from the American Heart Association. Circulation 2007; 115:2575 – 2682.**

# Home based Training - A Benefit for End-Users

- Continuous supervised training at home
- Flexible time schedule
- Personalized training exercises
- Support  by therapists
- Reduce the costs of therapy
- Continuous training data acquisition and analysis
- Establishment of a nationwide phase III,IV rehabilitation

# Project Milestones

- Establishment of a phase III, IV rehabilitation program
- Development of a simple, low cost, novel therapeutic process performed in one‘s own four walls (Home based Training)
- Increase motivational aspects for end users
- Continuous monitoring of vital signs and training progress
- Training exercise repository
- Decision Support System for therapists and doctors
  - Adapt training exercises to end-users
  - Visualize training data and trends -> motivation
  - Training Analysis
- Extensive study with over 80 end-users



# Health@Home System Overview

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**Trainings Monitoring**

**Vital signs**

**Strength Measurement**

Multimodal Monitoring

**Trainings Decision Support System**

**Feedback**



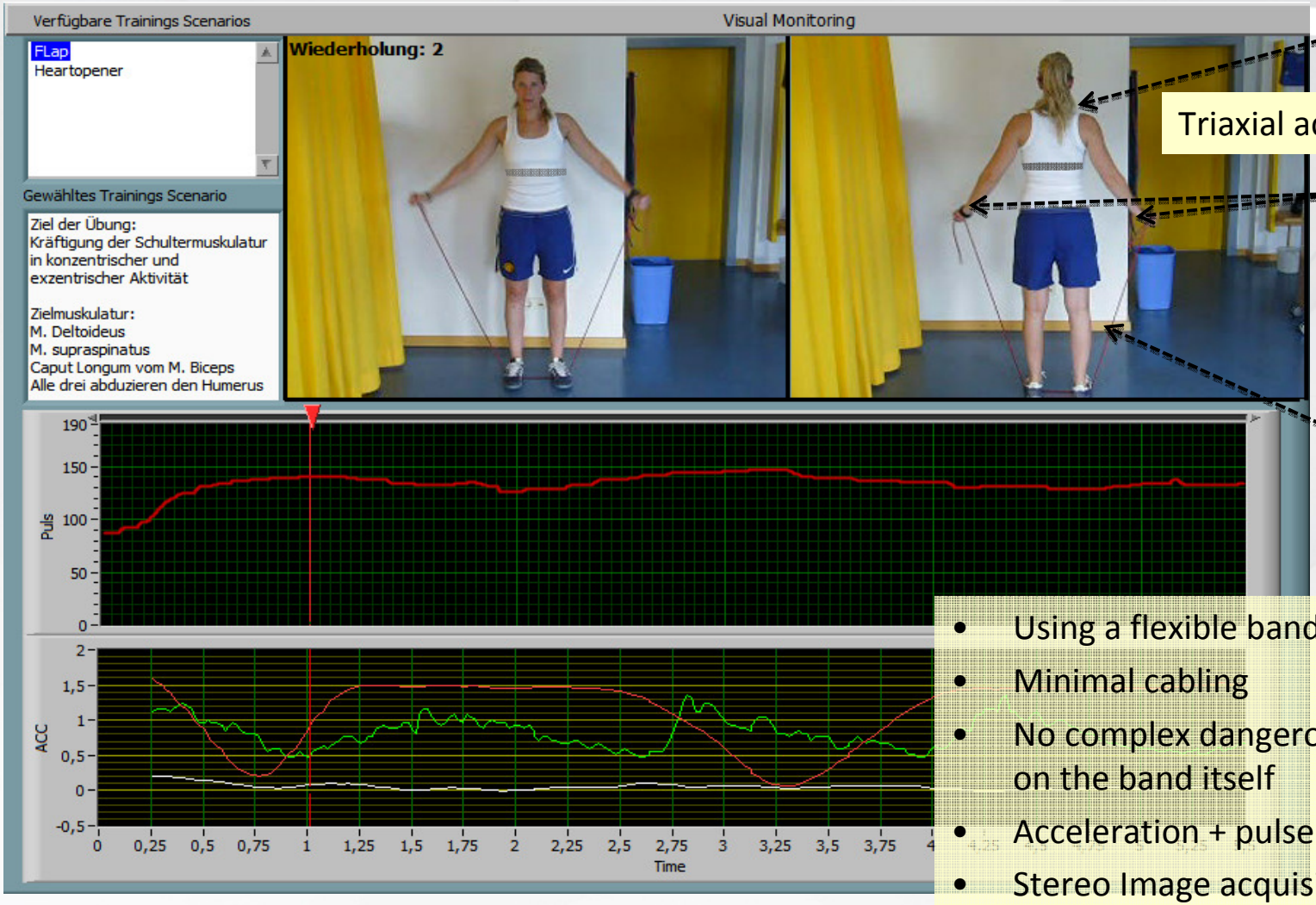
**Training-Coach**

Internet

**Trainings Data Repository**

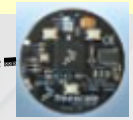
**Extensive Tests with 80 end-users are planned in 2011**

# Acquisition of Reference Training Exercises




Pulse Sensor

Triaxial acceleration sensors



Elastic Band

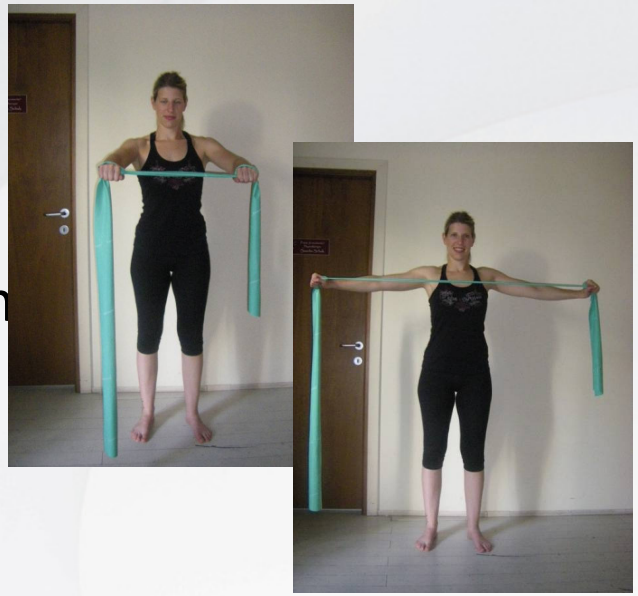
- Using a flexible band for all exercises
- Minimal cabling
- No complex dangerous application on the band itself
- Acceleration + pulse sensors
- Stereo Image acquisition of the training

# Study with End-Users

- About 80 end-users will attend this study
- Extensive tutorial with the end-users at the beginning of the study in small groups
- Rehabilitation experts are supporting the end-users during their training exercises
- Tests are performed over a minimum period of 2 month
- Consideration of ethical aspects

Questions to be answered:

- Is the system easy to use ?
- Are the users motivated to use the system
- Are there any fears to use the system?
-

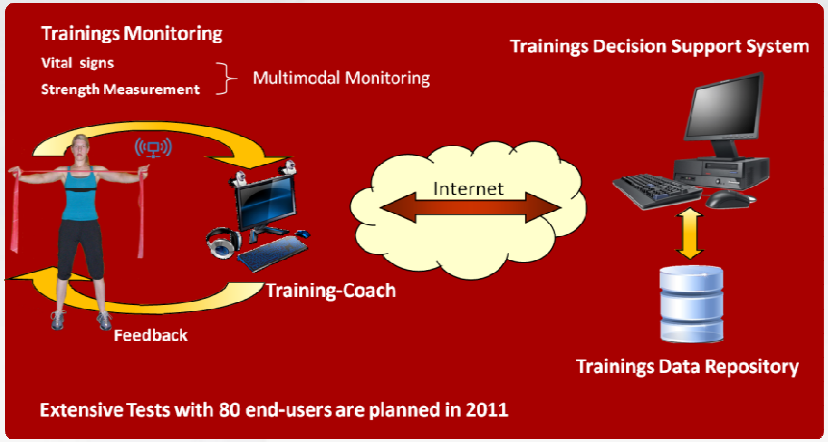


# Summary and Future Steps

- Project started in May 2009
- Low cost „Home based Training System“ for Phase III, IV cardiac rehabilitation and prevention
- Training Exercise Repository
- Continuous monitoring of vital signs and strength
- Online analysis and decision support for therapists and doctors
- Extensive study at the end of the project with over 80 end-users

Planned activities in the near future

- Acquisition of reference training exercises planned in October 2009
- Sensor data acquisition ongoing
  - Vital signs
  - Strength
- Planning of the study



# Thank you for your Attention


## Keep moving !