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Ambient Assisted Living
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CASA SOLLIEVO DELLA SOFFERENZA • SAN GIOVANNI ROTONDO •

MARIO

MARIO Project: experimentation in a hospital setting

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Introduction

MARIO: Healthy aging with use of caring service

MARIO is a companion robot being designed to work with older people and people with dementia.

MARIO addresses the difficult challenges of loneliness, isolation and dementia in older persons by providing an **interactive** and **extensible** service robotics platform targeted towards healthy aging.

MARIO is already deployed in pilot sites in Ireland, Italy and the UK!

Want to know more?

Join our project network by sending an email to: info@mario-project.eu

Key Features of MARIO

MARIO aims to address the difficult challenges of loneliness, isolation and dementia in older persons.

- Focuses on addressing the needs of people with dementia and their caregivers.
- Tested with end users and in assisted living environments.
- Supports caregivers and physicians with comprehensive geriatric assessments (CGAs).
- Capable of supporting and receiving "robot applications" similar to the developer and app community for smartphones.
- Use of semantic computing methods to make MARIO more personable, useful, and accepted by end users.
- Uses state of the art robotic platforms that are flexible, modular, friendly, low cost and close to market ready in order to provide real and affordable solutions for people with dementia.
- Bring MARIO service robot concepts out of the lab and into industry.

Chronicle

- Focus groups (April-May 2015)

- Survey of the needs (May-November 2015)

- Customization of the CGA (November 2015 – January 2016)

- Implementation stage

- MARIO arrived in Casa Sollievo della Sofferenza (August 24, 2016)

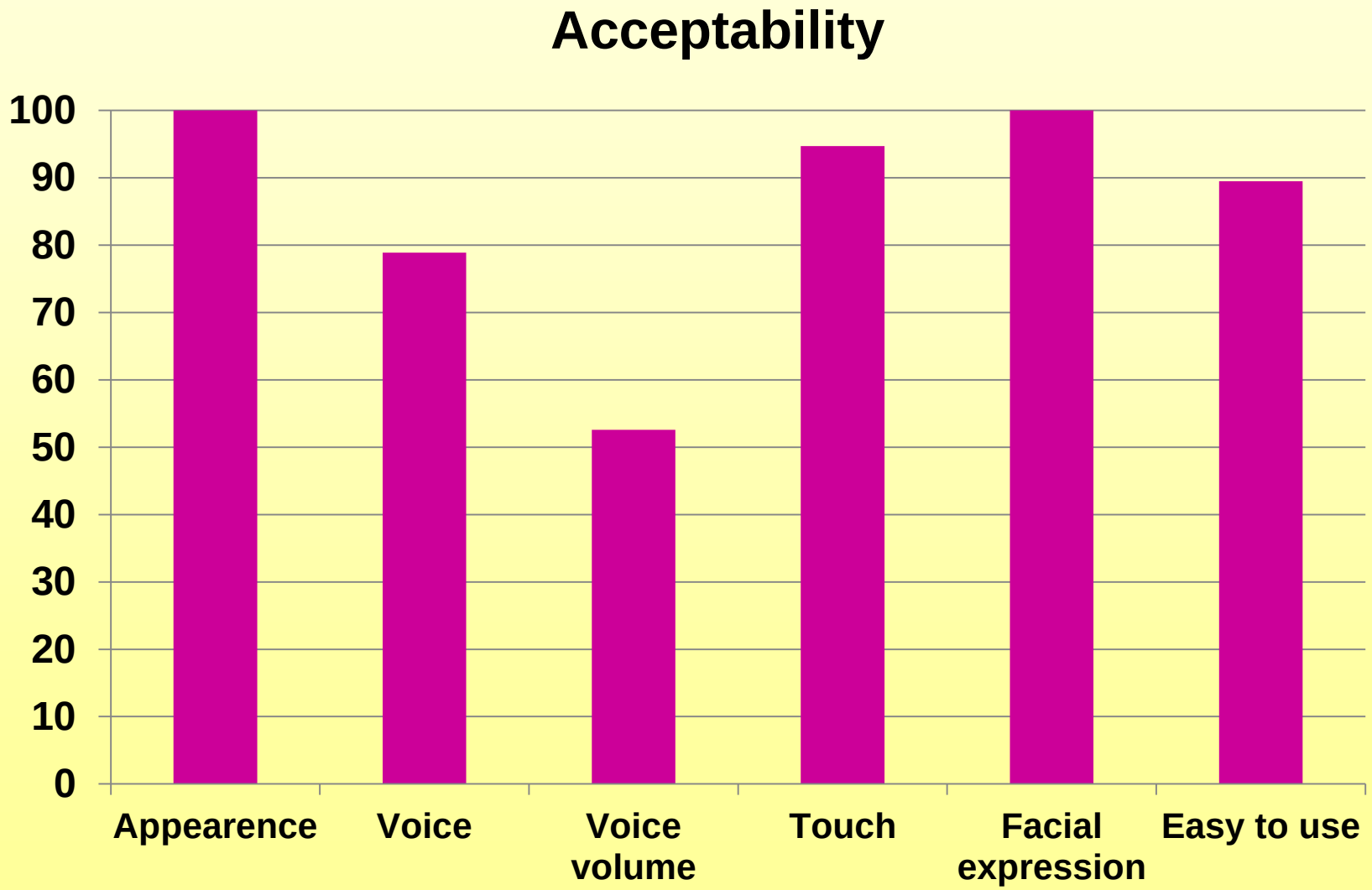
The experimentation stage begins…

Experimentation stage (September 2016): Preliminary results (1/3)

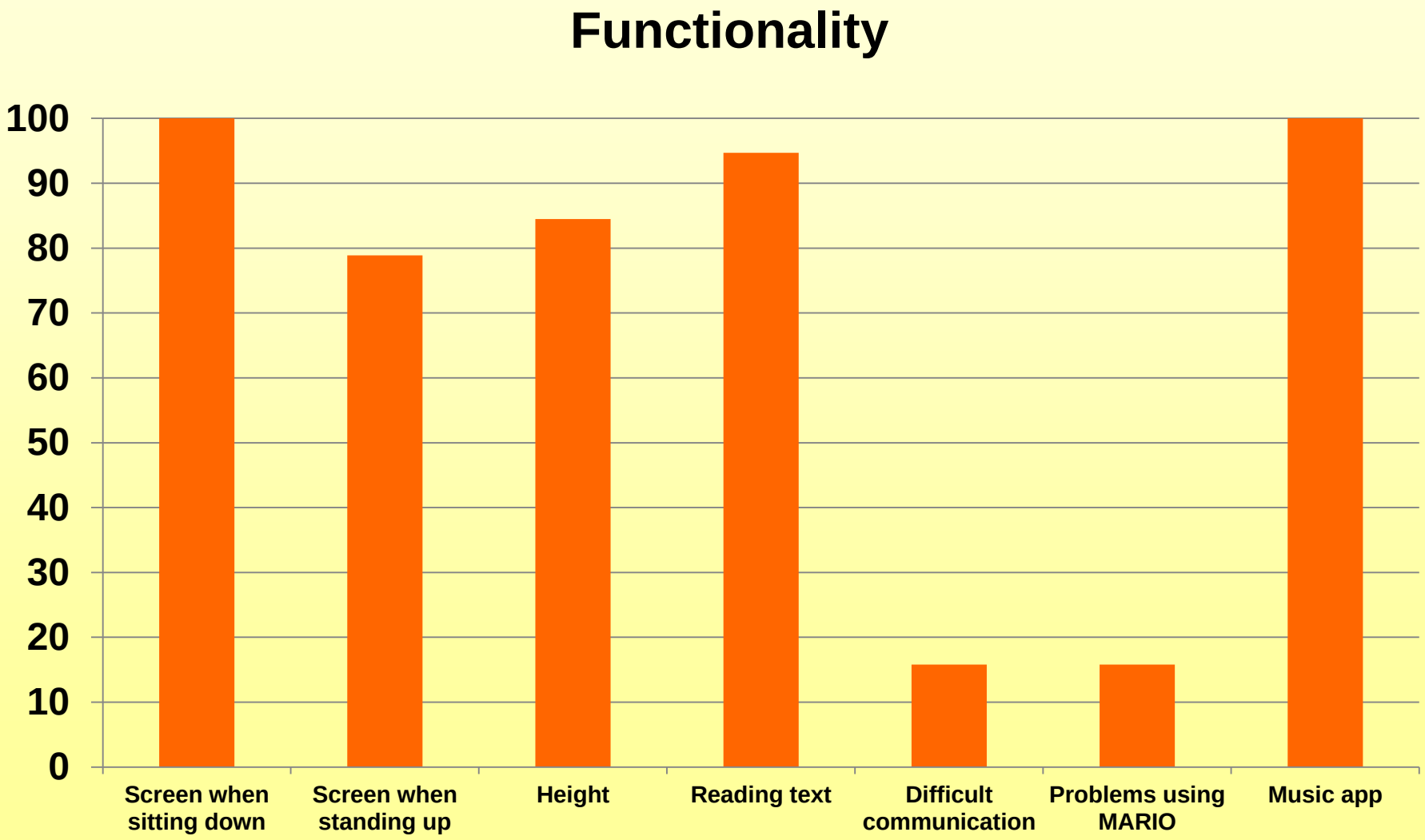
We are administering a 13-item questionnaire that evaluates:
A) Acceptability
B) Functionality

19 patients with mild cognitive impairment (M=6, F=13) with a mean of educational level of 9.63 ± 5.64

Experimentation stage: Preliminary results (2/3)



Experimentation stage: Preliminary results (3/3)



First and Second Trial: Material and Methods 1/2

Inclusion criteria:

1) **age ≥ 65 years;**

2) **patients with diagnosis of mild dementia according to the criteria of the National Institute on Aging-Alzheimer's Association (NIAAA);**

3) **the ability to provide an informed consent or availability of a proxy for informed consent.**

First and Second Trial: Material and Methods 2/2

At admission and at discharge, the following parameters were collected:

- **Demographic data**
- **Clinical and medication history**

Cognitive and affective assessment

1. Mini Mental State Examination (MMSE)
2. Clinical Dementia Rating (CDR)
3. Clock Drawing Test (CDT)
4. Frontal Assessment Battery (FAB)
5. Hachinski Ischemic Scale (HIS)
6. Neuropsychiatric Inventory (NPI)
7. Geriatric Depression Scale (GDS-15)
8. Hamilton Rating Scale for Depression (HDRS-21)

Evaluation of social aspects and resilience

1. Multidimensional Scale of Perceived Social Support (MSPSS)
2. Social Dysfunction Rating Scale (SDRS)
3. Brief Resilience Scale (BRS)

Quality of life and Caregiver burden level assessment

1. Quality of Life in Alzheimer's Disease (QOL-AD)
2. Caregiver Burden Inventory (CBI)

Mobility Assessment

1. Tinetti Balance Assessment (TBA)

Acceptability Assessment

1. Almere Model Questionnaire (AMQ)

First Trial (November-December 2016): Implemented apps

- My Music app
- My Game apps
- My News app

First Trial: Results 1/3

Table 1. Demographic characteristics of the patients with dementia that had used MARIO robot during the first trial.	
	All
	(n = 5)
Gender - Males/Females	3/2
Males (%)	60.00
Age - Mean ± SD	74.20±10.06
Educational level - Mean ± SD	9.00±6.21
Hospitalization days - Mean ± SD	7.60±4.30
Time of interaction with MARIO (min/die) - Mean ± SD	60.00±0.00
My Music app (min/die) - Mean ± SD	41.00±5.48
My Games app (min/die) - Mean ± SD	19.00±5.48
My News app (min/die) - Mean ± SD	0

First Trial: Results 2/3

Table 2. Clinical characteristics of the patients with dementia that had used MARIO robot during the first trial.

	Admission	Discharge	P value
MMSE - Mean ± SD	19.66 ± 1.67	19.42 ± 1.83	0.317
CDR - Mean ± SD	1.00 ± 0.00	1.00 ± 0.00	-
CDT - Mean ± SD	2.80 ± 1.92	2.80 ± 1.92	-
FAB - Mean ± SD	13.00 ± 1.22	13.00 ± 1.22	-
NPI - Mean ± SD	24.40 ± 10.24	24.80 ± 10.35	0.317
GDS-15 - Mean ± SD	5.80 ± 1.64	5.40 ± 0.89	0.414
HRSD-21 - Mean ± SD	9.80 ± 3.96	8.60 ± 2.70	0.655
MSPSS - Mean ± SD	71.20 ± 14.96	71.20 ± 14.96	-
SDRS - Mean ± SD	28.20 ± 4.60	28.20 ± 4.60	-
BRS - Mean ± SD	16.80 ± 1.79	16.80 ± 1.79	-
QoL-AD - Mean ± SD	32.40 ± 5.13	34.00 ± 5.34	0.180
QoL-Family - Mean ± SD	39.60 ± 11.84	39.60 ± 11.84	-
CBI - Mean ± SD	18.00 ± 6.93	18.00 ± 6.93	-
TBA - Mean ± SD	8.80 ± 4.92	8.80 ± 4.92	-

First Trial: Results 3/3

Table 3. Distribution of Almere Model Questionnaire domains in patients with dementia during the first trial.

Code	Construct	Definition	%
ANX	Anxiety	Evoking anxious or emotional reactions when using the system	0
ATT	Attitude	Positive or negative feelings about the appliance of the technology	80
FC	Facilitating condition	Objective factors in the environment that facilitate using the system	100
ITU	Intention to use	The outspoken Intention to Use the system over a longer period in time	60
PAD	Perceived adaptivity	The perceived ability of the system to be adaptive to the changing needs of the user	60
PENJ	Perceived enjoiment	Feelings of joy or pleasure associated by the user with the use of the system	100
PEOU	Perceived Ease of use	The degree to which the user believes that using the system would be free of effort	40
PS	Perceived sociability	The perceived ability of the system to perform sociable behavior	80
PU	Perceived usefulness	The degree to which a person believes that using the system would enhance his or her daily activities	80
SI	Social influence	The user's perception of how people who are important to him think about him using the system	60
SP	Social presence	The experience of sensing a social entity when interacting with the system	40
TRUST	Trust	The belief that the system performs with personal integrity and reliability	60
USE	Use/Usage	The actual use of the system over a longer period in time	60

Second Trial (April 2017): Implemented apps

- My Music app
- My Game apps
- My News app
- My Calendar app
- My Family and Friends app
- CGA app

Second Trial: Results 1/3

Table 4. Demographic characteristics of the patients with dementia that had used MARIO robot during second trial.

	All
	(n = 8)
Gender - Males/Females	6/2
Males (%)	75.00
Age - Mean ± SD	80.50±6.59
Educational level - Mean ± SD	4.25±1.75
Hospitalization days - Mean ± SD	5.63±3.89
Time of interaction with MARIO (min/die) - Mean ± SD	77.50±39.91
My Music app (min/die) - Mean ± SD	25.63±4.96
My Games app (min/die) - Mean ± SD	18.75±15.53
My News app (min/die) - Mean ± SD	6.87±5.94
My Calendar app (min/die) - Mean ± SD	3.75±3.54
My Family and Friends app (min/die) - Mean ± SD	3.13±2.59
CGA app (min/die) - Mean ± SD	20.63±17.41

Second Trial: Results 2/3

Table 5. Clinical characteristics of the patients with dementia that had used MARIO robot during second trial.

	Admission	Discharge	P value
MMSE - Mean ± SD	24.01 ± 2.37	24.39 ± 2.26	0.180
CDR - Mean ± SD	0.63 ± 0.35	0.50 ± 0.27	0.157
CDT - Mean ± SD	2.63 ± 1.85	2.50 ± 1.93	0.317
FAB - Mean ± SD	12.75 ± 3.49	12.75 ± 3.49	-
NPI - Mean ± SD	6.25 ± 7.59	2.00 ± 2.77	**0.027**
GDS-15 - Mean ± SD	3.75 ± 3.62	1.63 ± 1.85	**0.042**
HRSD-21 - Mean ± SD	5.00 ± 5.66	1.13 ± 2.42	0.068
MSPSS - Mean ± SD	79.00 ± 5.95	80.50 ± 5.43	0.317
SDRS - Mean ± SD	24.25 ± 1.75	24.50 ± 1.85	0.317
BRS - Mean ± SD	18.13 ± 1.64	20.63 ± 1.77	**0.041**
QoL-AD - Mean ± SD	33.50 ± 5.63	38.25 ± 3.81	0.066
QoL-Family - Mean ± SD	37.25 ± 3.37	37.25 ± 3.37	-
CBI - Mean ± SD	4.50 ± 5.09	3.50 ± 4.18	**0.046**
TBA - Mean ± SD	9.25 ± 0.46	9.25 ± 0.46	-

Second Trial: Results 3/3

Table 6. Distribution of Almere Model Questionnaire domains in patients with dementia during the second trial.

Code	Construct	Definition	%
ANX	Anxiety	Evoking anxious or emotional reactions when using the system	0
ATT	Attitude	Positive or negative feelings about the appliance of the technology	90
FC	Facilitating condition	Objective factors in the environment that facilitate using the system	100
ITU	Intention to use	The outspoken Intention to Use the system over a longer period in time	70
PAD	Perceived adaptivity	The perceived ability of the system to be adaptive to the changing needs of the user	80
PENJ	Perceived enjoiment	Feelings of joy or pleasure associated by the user with the use of the system	100
PEOU	Perceived Ease of use	The degree to which the user believes that using the system would be free of effort	30
PS	Perceived sociability	The perceived ability of the system to perform sociable behavior	80
PU	Perceived usefulness	The degree to which a person believes that using the system would enhance his or her daily activities	90
SI	Social influence	The user's perception of how people who are important to him think about him using the system	60
SP	Social presence	The experience of sensing a social entity when interacting with the system	20
TRUST	Trust	The belief that the system performs with personal integrity and reliability	60
USE	Use/Usage	The actual use of the system over a longer period in time	60

Conclusion

Finally, the collected data show a satisfactory integration between the patients with dementia and the system along with a great level of acceptability of MARIO robot by the end-user, both the patients themselves and the caregivers or medical providers, those who, day by day, take care and assist their patients.

The work is going on!

Partners

- National University of Ireland, Galway
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Thank you!

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- Contact

  http://www.mario-project.eu/