Maintaining Elder Independence with Technology

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- Program Goal

  Develop an intelligent home automation system with situation awareness and decision-making capability based on integration of diverse sensors to support enable elderly users to live independently at home and to support family caregivers

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- **Program Aims**

  *Support elder independent living

  *Provide peace of mind to caregivers

  *Support efficient quality of care for caregiving organizations

  *Provide cost savings for government and industry

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i.L.S.A.

Quality of life

- Desire to maintain independence
- Limitations
  - Arthritis (49%)
  - Hypertension (35%)
  - Heart Disease (31%)
  - Hearing (31%)
  - Activities of daily living
  - Falling
  - Fraud

Support systems (Caregivers)

- Institutions are costly
- Remote families
- Decreased availability (aging population)

Technology developments

- Widespread, diverse products and services
- Lack overall, integrated infrastructure
- Resistance to new technology

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- Correlates of Elder Institutionalization
  - **Safety**
  - **Dementia**
  - **Caregiver Burnout**
  - **Medication Management**
  - **Medical Monitoring**
  - **Toileting**
  - **Mobility**
  - **Eating**
  - **Transportation**
  - **Isolation**
  - **Managing Money**

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Results of Home Care Analysis

- Assessing and Monitoring Function
- Coordinating Care
- Managing Information
- Educating the Care Community

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- **Field Test Aims**
  - **Gather information about elder, activity, and home status by listening to the home and communicating with devices**
  - **Assess the need for assistance based on the systemís understanding the elderís condition and what activities are going on inside the home**
  - **Respond to a given situation by providing assistance to the elder and getting help when necessary**
  - **Share health and status information with authorized caregivers to help improve the quality and timely delivery of care**

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What ILSA Looked Like

- Control Boxes
  - Wireless base station - Hidden in closet, talks to sensors
  - Telephone - I.L.S.A can call elder with a message
  - WebPad - Elder able to get information from I.L.S.A.
- Sensors
  - Motion Sensors - Sense motion in a room
  - Call Button - Same as elderís current call button
  - Medicine Caddy - Tells I.L.S.A. when medications taken

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- **What ILSA Did**

  Functions[1]

  - **Reminders: Notes to help elder remember what to do today**
  - **Mobility[2]: Summary of elder activity level for each time period of the day**
  - **Medicine[2]: List of the medications elder should take and whether he or she opened the caddy at the correct time**
  - **Controls: The status of I.L.S.A. in elderís home (on/off)**
  - **Help: What to do in an emergency and who to call if elder required assistance**

  Support

  - **Caregiver/family member, user guides, and technical support**

[1]Critical to have accurate information

[2]Thresholds have been established to issue alerts for these functions

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- **Messages/Alerts**

  An alert suggested that the caregiver may want to check on the parent at his/her convenience. Caregivers were called with alerts, and saw them on the web browser.

  - No Mobility for more than 5 hours during normal wakeful times
  - A 50% increase or decrease in mobility (activity) from normal levels over the course of three days.
  - Missed medications for a period of at least 24 hours.

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- Field test aims
- Assess design of interface and interaction
- Assess attitudes and perceptions of elders and family caregivers
- Assess patterns of behavior
- Evaluate system operation
- Evaluate system effects

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Field Test

Design: Longitudinal, single group repeated measures

- **Sites: Minnesota and Florida independent and assisted living facilities**
- **ILSA placed in all homes**

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- Sample

  Inclusion criteria:

  1. Takes one or more medications daily
  2. Independent in ADLs
  3. Needs assistance with one IADL
  4. Has family caregiver who provides regular support
  5. Family caregiver willing to participate

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- Field Test Measures

  Useability questionnaires-weekly, monthly

  Motion sensors

  Medication caddy sensors

  Elder health: SF-36

  Elder cognition level: MMSE

  Elder comfort with technology

  Focus groups: elders and caregivers

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- Short Form-36 (SF-36)

  Physical Health
    - Physical functioning
    - Role-physical
    - Bodily pain
    - General health

  Mental Health
    - Vitality
    - Social functioning
    - Role-emotional
    - Mental health

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- Field Test Results

  Demographics (n=7)

  Age: 83.42 (range 76-96)

  Gender: 1 male, 6 female

  Marital status: 6 widowed, 1 married (f)

  Level of education: 4 HS, 2 College grads, 1 mastersí degree

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- Comfort with technology: 40.29 (range 37-45)
- Mobility
- One uses wheelchair for long distances, walker in apt.
- Others very active; all but two still drive

Med Adherence:

- One has meds set up
- Others set up own weekly
- Number of meds range from 1-16 per day

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- Field Test Results
  - Elders are living independently
  - All were physically active
  - All were ìhealthyî with at least one chronic illness
  - All were comfortable with remotes, programmable appliances
  - Five had some computer literacy-wide variation in abilities

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Field Test Results: SF-36

SF 36 FACTORS	T1	T2	T3	p
Physical Function	62.9 (21.6)	59.3 (22.9)	50.7 (20.3)	.38
Role-Physical	53.6 (44.3)	53.6 (36.6)	57.1 (34.5)	.97
Pain	76.8 (25.4)	84.9 (19.2)	72.3 (27.8)	.51
General Health	71.6(35.9)	66.9 (21.0)	65.9 (23.8)	.76

(Standard Deviation)

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Field Test Results: SF-36

SF 36 FACTORS	T1	T2	T3	p
Vitality	52.9 (24.8)	58.6 (20.3)	49.3 (15.4)	.29
Social Function	87.5 (17.7)	91.1 (15.7)	75.0 (22.8)	.21
Role-Emotional	83.3 (27.9)	90.5 (25.2)	76.2 (46.0)	.75
Mental Health	82.9 (11.9)	86.9 (6.8)	76.6 (14.7)	.09

(Standard Deviation)

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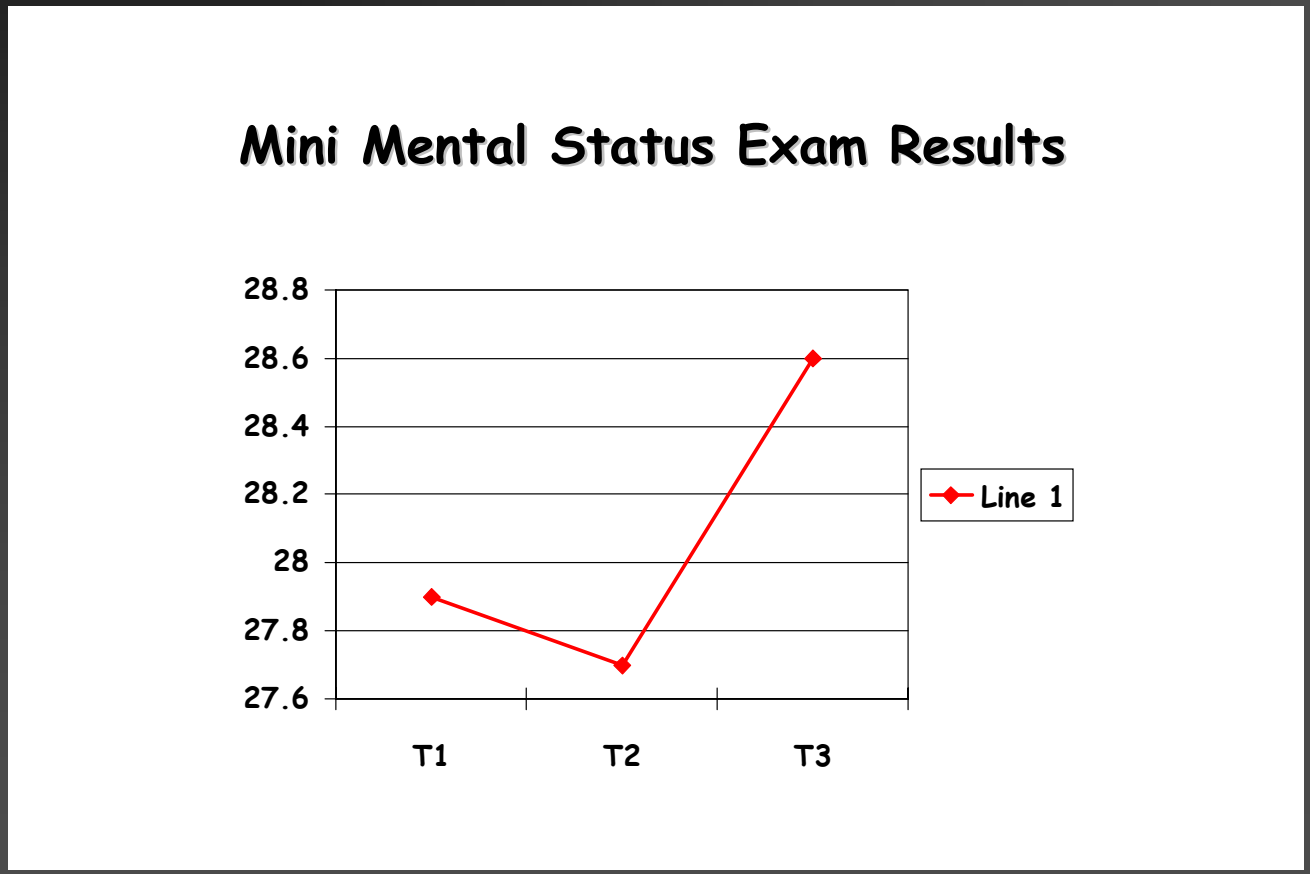

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- Field Test Results: Correlations

Age with general health	.245	.487	.721
Age with pain (p=.023)			.823
Gender (f)with PF	-.618	-.612	-.618
Gender (f) with MMSE	.683	.642	.642
Comfort with MH	-.430	-.731	-.542

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- Field Test Results: Focus Groups

- Enjoyed interactivity-desired more
- Disliked telephone remindersó tried to ìbeat the systemî
- Able to tolerate multiple devices
- Liked medication caddies
- Challenged by ILSA
- Greatest fear is falling, then safety

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