Universal Design and “Smart” Technologies for the Older Adult

RESNA’s Occupational Therapy PSG:
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Objectives

1. Participants will learn about 5 universal design products that can aid with activities of daily living and home safety.

2. Participants will be able to identify smart phone “apps” to support persons with vision, hearing, and/or cognitive impairment function in their homes.

3. Participants will identify and describe appropriate use of 4 “smarthome” technologies to support function in home and community.

4. Participants will learn low to high tech interventions to support function in the home and community.
Universal design products that can aid with ADLs and home safety

Lynn Gitlow, Ph.D., OTR/L, ATP
Systematic application of theory and practice

- Use a conceptual practice framework to guide your thinking
- Do a thorough assessment
- Intervention with teaching and support for all stakeholders
- Outcomes assessment
Universal Design

- The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (CUD, 1997).
Concept of UD then and now

- Originally emerged from the disability rights movement
- Since then other factors have influenced the knowledge base of UD including
  - Design for aging - the silver tsunami-inclusive design
  - Social sustainability and
  - Concept of user center design
- A process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation.
  
  (Steinfeld and Maisel, 2012)
Aging in Place

- Our homes have been for the most part may become inadequate to meet our physical and social needs.
- Universal design seeks to address these needs given the importance of context in promoting health and wellness (WHO, 2001).
- WHO Age Friendly initiative expands this notion from the home (ADL’s) to community IADL’s
Promoting performance
Preventing Falls- Bathroom

Medication Management

Low Tech: case study Client who had difficulty remembering to take mads but did not want to remove meds from pill bottle- low tec jig made our of cardboard.

High Tec

- http://www.reminder-rosie.com/
- https://www.medminder.com/
- https://herohealth.com/
Connecting technologies

![Percent of adults who go online](image)

- **86%** All adults
- **59%** Seniors 65+

Resources and Programs for Educating Elders how to Use Technology

- http://www.aarp.org/home-family/personal-technology/tek/
- http://cyberseniorsdocumentary.com/
- http://oats.org/
Smart phone “apps” and options to support function

Anne Cronin, PhD, OTR/L
RESNA 2016
1. Helping the **Person** access the **Device**

What does the **client/family** need or want to do?
Scaffold steps needed to achieve learning goals.

What are the **client/family's** special needs?
Consider accommodations and modifications
Consider therapist-selected interventions.

What are the **client/family's** current abilities?
Start by adapting the device for the person

- Screen lock
- Guided Access – allows you to lock in and out features
- Use Accessibility features (low vision or fine motor controls)
  - Speech recognition (Voice over/Talkback)
  - Speak screen
  - Dictate text
  - Predicative text
  - Touch accommodations

Ipad
Settings...
Apps for Phone access

- Communication Tool By Social Care Alba
- Seniors phone - Free Version! MediTrade
- Simple Phone Seniors DuckMa Srl
Apps for Phone access

**EasyFamily AppSuite®** by Family Ribbon takes the complexity out of Facebook, Skype, Picasa, Gmail, and internet browsing, and creates an intuitive online environment for beginners. The AppSuite is designed specifically for those with no or little computer experience - maybe your parents or grandparents.

- Skype and Facetime calls can be easily launched with Easy Start
- Easy Email includes audio/video messages attachments as well as ‘white list’ security feature
- Facebook - EasyFamily Social® for Facebook comes with ‘Safe Mode’ and intuitive interface
- Reminders - handy to keep track of medication schedules and upcoming events. A family member will receive an email or text if reminders have been ignored.

Integrated EasyFamily Apps provide an intuitive communication and entertainment platform for beginners and more advanced users

- ‘Call Back’ - send pre-set email or texts call back request with just two touches or clicks
- ‘Photo Frame’ - personalize application by uploading up to 30 pictures remotely for your family to view
- Weather – one touch access to weekly forecasts
- ‘Family Albums’ - easy viewer for family photos on Flickr, Picasa and Facebook
Health

Access to Medical Records
Health monitoring (blood pressure, blood sugar)
Medication reminders
Health diaries (mood, pain, fatigue, diet, exercise)
Medical Records

- **Medi+Safe - Electronic Personal Health Record** IntegraCare Solutions, Inc.

- **My Medical Info** Deardorff Digital LLC
Health Supports

- HeartWise Blood Pressure Tracker
  Easily record your blood pressure, your resting heart rate and your weight, and you’ll be able to track it on a daily basis and over time.

- iBP Blood Pressure
  This app requires you to have a separate monitor, but it is an important app for anyone who has issues with their blood pressure. This app will track and analyze blood pressure over a certain period of time.
Health Supports

- Glucose Companion Maxwell Software
- Blood Glucose Tracker Little Bytes Software
- Glucose Buddy - Diabetes Logbook Manager w/syncing, Blood Pressure, Weight Tracking Azumio Inc.
Health Supports

Pillboxie (iPhone)
- Remembering you have to take your medication is important – but just as important is remembering, which medications you have to take at which times. You can even customize your meds with different combinations of med types and colors.

Pill Reminder Pro (iPhone)
- By Bahtiyar Polat
Health Supports

T2 Mood Tracker is designed to help you track your emotional experience over time and to provide you with a tool to share this information with your health care provider.

MyMoodTracker  Aspyre Solutions
Health Supports

Pain Diary & Community
CatchMyPain PRO Sanovation AG

Manage My Fatigue Michelle Wild
Safety

- Motion/Fall detection
- Emergency call system
- Community mobility
- Family communication
Safety

Fall Detector ITER S.A.,
- Fall Detector is a special app that lets you know if there is a longer-than-normal period of no movement, the signal will sound so you will be alerted and you can check up on them.
- v.SOS FREE Nuvel Inc.
- Comfort Zone Check-In Mobile allows caregivers to view the current location, last known location, and get directions.
Community mobility

- Park’n’Forget (iPhone)

- Never forget where you parked your car again! Input what floor you’re on and what aisle or spot, and you’ll never roam the parking garage again. It also has a convenient “Parking Meter” timer, that alerts you when you’re parking meter is about to expire.
LifeChest FREE 4+ iphone & ipad

Erin Cole

LifeChest is the information storage app you've been waiting for! LifeChest is the one app for gathering your most important life information into one digital location. This app is a great tool for helping grown children gather information as they help care for aging parents! The Health and Insurance tabs are amazing resources to collect this info for doctors visits; the Banking and Financial tabs insure that account numbers and passwords are handy for handling financial manners over the phone; and with all of your Home Maintenance and Utilities information you'll never have to dig through mounds of bills to look for account numbers as you deal with vendors.
When the Person has a vision impairment...

1. People who are blind and some people with low vision are unable to locate the controls of a touch screen device.

2. Audible output is required for users with visual impairments to access the information that results from activating the controls.

3. Consider application that may improve participation
When the Person has a hearing impairment…

1. Individuals who are hearing impaired and use a hearing aid will want a cellphone that is most compatible with hearing aides (minimize likelihood of microphone interference and greatest likelihood of telecoil coupling compatibility with the cell phone.)

2. Increased (to total reliance) on text messaging

3. Consider application that may improve participation
App Decision Making....

- What features make it user friendly?
- Free apps often have advertisements or limited features
- Free apps usually do not have support for users
- Apps from Mainstream sources are more likely to update and keep the app compatible with OS upgrades
Summary
iPad groups in community-based settings for the older adult

Sara Benham, OTD, OTR/L, ATP
RESNA 2016
Introduction

- Within the population of older adults, cognitive performance moderately declines with increasing age which may have further effects on the skills required to complete ADLs and IADLs\(^1\).

- Creating age-friendly environments that include AT service initiatives to enable autonomy and facilitate functioning may be a realistic solution.

- This may be achieved by community-based or home-based services to address the associated physiological, cognitive, behavioral, and functional changes that accompany aging in order to maintain independence.
Society’s dependency on technology

- The increase in dependency of society on computing technology has also changed how individuals may participate in ADLs and IADLs through easier access to a virtual context.

- Additionally, significant findings support that computer usage may be correlated with an increase in independence in ADLs. This might be attributed to the convenience and accessibility for the user to easily and efficiently complete many different tasks within a virtual context, while previously completed through manual or person-to-person interactions.
Older adults’ access to technology

- 59% of the older adults (65 years or older) reported using the internet with 47% reporting a broadband connection at home\(^3\).
- Of polled seniors, 27% reported owning a tablet and/or e-book, while only 18% reported owning a smartphone\(^3\).
- A variety of barriers to access a computer and internet have been identified, including lack of familiarity and training with computers, feelings of inadequacy, and declining visual and motor coordination skills\(^4\).
Why tablets?

- **Touch screen technology**
  - Touch screens offer a direct input-display relationship, allow good hand–eye coordination, and can be space efficient\(^5\).
  - Visual feedback on current cursor location and on accuracy of operator’s action helps reduce error rates in touch screen technology\(^6\).

- Although sufficient research on older adults and computer use exists, there is little evidence supporting that use of specific mobile computing devices, such as tablet computers, and the effect on the daily lives and routines of older adults.
Program Overview:

- Our aim was to teach and integrate the use of mobile computing technology and software applications within the daily lives of senior clients at a community day center (an older adult healthcare program that operates out of West Philadelphia).

- Evaluated changes in self-reported participation and satisfaction of performance in ADLs/IADLs for older adults after an 8-week educational training program on tablet computers and application software programs (apps).
Foundations

Technology Acceptance Model

- Perceived Usefulness
- Perceived Ease of Use
- Intention to Use
- Usage Behavior
Using Hettler’s wellness model (1976) as a framework, an “App Class” promoted participation in physical, intellectual, social, emotional, and environmental occupations, for a more holistic experience.
Subjects

- 8 participants, who were at least 60 years of age and had little to no prior exposure to mobile computing technology usage

Inclusion Criteria:

- Demonstrated motor, cognitive, and visual skills to use a tablet computer
- MMSE Score >25
- Attended ≥ 2 days/week at LIFE

<table>
<thead>
<tr>
<th>Participant Demographics (n=8)</th>
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</thead>
<tbody>
<tr>
<td>M (SD) or n (%)</td>
</tr>
<tr>
<td>Age, years</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Ethnicity</td>
</tr>
<tr>
<td>MMSE</td>
</tr>
</tbody>
</table>
Methodology

- Introductory Session
  - Pre-Intervention Assessments (COPM)
  - Participants received their Tablet
- 8 week Educational and Training Program
  - Bi-weekly participation
    - 1 hour educational session
    - 1 hour open laboratory (1:1 assistance)
- Exit Session
  - Post-Intervention Assessment (COPM, TAM, Interviews)

- Funding provided by a grant from Genesis Healthcare
## Educational Program Curriculum

<table>
<thead>
<tr>
<th>Phase</th>
<th>Week</th>
<th>Educational Topic</th>
<th>Software Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Participants received their devices and learned about basic operations, button configuration, charging the device, and maintenance of the device and case.</td>
<td>Settings</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Participants learned how to open basic software applications, use the touch screen functions, use of the keyboard, and connect to WiFi and the internet. All participants also signed up for Email accounts.</td>
<td>Safari, Settings, Mail, Gmail, Yahoo Mail</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>The group focused on using basic software applications as cognitive aids for memory. The group also used applications for spatial navigation.</td>
<td>Calander, Clock, Notes, Reminders, Apple Maps, Google Maps</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Group sessions were aimed at showing participants how to navigate the App Store and download their own software programs. Participants also began to use their camera to take pictures of important reminders and notes.</td>
<td>App Store, Camera, Photo Booth, PhotoGrid</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Participants evaluated their routines and identified which applications could be used to simplify tasks. Participants then explored applications from the App store that dealt with <strong>physical and intellectual wellness</strong>.</td>
<td>Heart Rate Monitor, Runmeter, Pedometer, WebMD, Pill Monitor, DigiFit, Memory Match, iMimic, Word Find App</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Participants explored applications from the App store that dealt with <strong>socialization</strong> and communication. Participants were also introduced to Video-chatting applications.</td>
<td>Facebook, Pinterest, Twitter, Messenger, FaceTime, Skype</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Participants explored applications for leisure and recreation. Also, applications for <strong>emotional and spiritual</strong> well-being were discovered.</td>
<td>Candy Crush, Slots, Bingo, Solitaire, Poker, Music, Pandora Radio, PodCasts, Bible App, Sleep Pillow, Flipboard</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Participants explored and downloaded Apps that best fit their self-identified needs and occupational performance problem areas. Participants would also go Banking Apps, Amazon, PeaPod, Shopping App, Simply Yoga, Allrecipes</td>
<td></td>
</tr>
<tr>
<td>Type of Issue</td>
<td>Area of Occupation</td>
<td>Common Theme Descriptors</td>
<td>Number of Participants that Identified (%)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Functional Mobility</td>
<td>ADL</td>
<td>“Walking”, “Getting Around”, “Ambulating”</td>
<td>7/8 (87.5%)</td>
</tr>
<tr>
<td>Communication Management</td>
<td>IADL</td>
<td>“Using the telephone”, “Using a computer”, “Getting an Email”</td>
<td>6/8 (75%)</td>
</tr>
<tr>
<td>Health Management and Maintenance</td>
<td>IADL</td>
<td>“Managing my health”, “Finding out about my conditions”, “Forgetting to take my pills”, “Exercising more”</td>
<td>5/8 (62.5%)</td>
</tr>
<tr>
<td>Community Mobility</td>
<td>IADL</td>
<td>“Traveling”, “Using SEPTA”, “Going out in community more”</td>
<td>4/8 (50%)</td>
</tr>
<tr>
<td>Household Management and Maintenance</td>
<td>IADL</td>
<td>“Doing housework”, “House projects”, “Cleaning my room”</td>
<td>2/8 (25%)</td>
</tr>
</tbody>
</table>
Results

- Outcome Measure: COPM Pre- and Post Intervention
- Analysis: Wilcoxon Signed Rank Test (Non-Parametric Data)

<table>
<thead>
<tr>
<th>Participant</th>
<th>Performance</th>
<th>Satisfaction</th>
<th>Performance</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.6</td>
<td>3.6</td>
<td>3.4</td>
<td>3.8</td>
</tr>
<tr>
<td>2</td>
<td>5.8</td>
<td>2.6</td>
<td>8.4</td>
<td>6.6</td>
</tr>
<tr>
<td>3</td>
<td>9.0</td>
<td>4.25</td>
<td>9.5</td>
<td>6.5</td>
</tr>
<tr>
<td>4</td>
<td>2.8</td>
<td>2.0</td>
<td>5.2</td>
<td>4.8</td>
</tr>
<tr>
<td>5</td>
<td>6.2</td>
<td>5.2</td>
<td>6.6</td>
<td>6.2</td>
</tr>
<tr>
<td>6</td>
<td>6.0</td>
<td>6.8</td>
<td>5.8</td>
<td>7.8</td>
</tr>
<tr>
<td>7</td>
<td>3.0</td>
<td>3.2</td>
<td>7.4</td>
<td>9.0</td>
</tr>
<tr>
<td>8</td>
<td>1.25</td>
<td>1.5</td>
<td>2.0</td>
<td>2.75</td>
</tr>
<tr>
<td>Median</td>
<td>4.7</td>
<td>3.4</td>
<td>6.2</td>
<td>6.35</td>
</tr>
</tbody>
</table>

Performance Median Difference = 1.5
p-value (Performance) = 0.0196

Satisfaction Median Difference = 2.95
p-value (Satisfaction) = 0.0039
Barriers

- Dropouts
  - Changes in day center attendance
  - Health-related concerns from participants

- Limited WiFi
  - Accessed HotSpot from researcher’s cellular phone
  - Preloaded Apps/Programs

- Loss or Damage to Tablets
  - Insurance (Apple Care)
Conclusion

• Moderate evidence ($p = 0.0196; p<0.05$) to support hypothesis of ADL/IADL **performance** increased after intervention (COPM Data)

• Strong evidence ($p = 0.0039, p<0.01$) to support hypothesis of ADL/IADL **satisfaction** increase after intervention (COPM Data)

• Self-identified problem areas gave the participants clear goals for how to implement device usage and apps to best assist themselves
  ➢ Self-exploration of apps

• Interviews revealed participant satisfaction with program and personal development of skills
  ➢ Participants utilized apps within daily/weekly routines

• Participants actively engaged in a structured group and 1:1 program are more likely to carryover of skills
References


Current and emerging smart home technology: the Internet of Things

Erin Muston-Firsch, MS, OTR
RESNA 2016
What is the Internet of Things?

“the network of interconnected things/devices which are embedded with sensors, software, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive.”

1
IoT Growth$^2$

Internet of Things (IoT): number of connected devices worldwide from 2012 to 2020 (in billions)

Source: Statista

Additional information:
Worldwide Internet of Things (IoT) Statistics 2014-2019
How Can IoT Support Aging in Place?

- Home Automation
  - Lights
  - Deadbolts/remote monitoring
  - Thermostat
- Health Monitoring and Safety
  - Daily HR/activity tracking
  - Emergency call
  - Fall alerts
- Memory Aids
  - Reminders
  - Scheduling
IoT Considerations for Aging Adults

- Universal Design/Ease of Use
- Setup/stability of system
- Type of wireless communication used
- Multiple products, multiple apps
- Remote vs centralized monitoring
- Device support/product longevity
- Device security to external threats
IoT Products to Support Aging in Place

- Home Monitoring/Automation
  - Lively
  - Amazon Echo
  - Apple Homekit
- Health Monitoring/Safety
  - GreatCall Wearable
  - Fitness trackers/Smartwatches
- Memory Aids
  - Droplet
  - Tile
Lively™

- Combines wearables and sensors to monitor patterns for food & drink, medication, activity, emergency call system, and fall prevention
- Utilizes cellular network (not Wifi)
- Remote monitoring from computer, internet, or mobile
- Push notifications to family members
- Initial hardware cost followed by monthly fee
Voice Controlled device with optional remote
Utilizes Wifi connectivity
Ability to set alarms
Integration with Google Calendar
Shopping/To-Do list
Music & Audiobooks
Web queries
Compatible with a host of lighting and fans, outlets, thermostats, deadbolts, wifi phone (Ooma), media control (Blumoo)
  - May or may not require an additional hub
  - Voice ordering through Amazon
  - Ever expanding Skills section
    - Ask My Buddy Personal Alert System
Apple Homekit

- Smarthome protocol that allows devices to be controlled through iOS 9 app
- Centralizes multiple brand devices through one app
- Siri compatibility: set custom rooms and scenes by voice
- Location, time, and accessory triggers
- Lighting, locks, heating and cooling, plugs/switches, shades, sensors
Greatcall Wearable

- Android compatible
- Activity tracker
- Fall detection
- Urgent response
- Nonurgent response
- Wrist or pendant wear
- Greatcall Link app allows family monitoring
Samsung Gear S2

- Activity and HR tracking
- Calendar reminders/notifications
- Wireless charging
- GPS
- Standalone call, text, email, & notifications
- Quarter-sized bluetooth button + app
- Attach to anything and it provides a location or time based notification
- Press the button once the task is completed to mark it as done
- Can provide single or repeated reminders
Bluetooth tracker

Attach to items that may commonly be lost

Locate items using Tile app

Audible tone within 100 feet

Press Tile to make your lost phone ring, even on silent

App records last time/place of item

Community Find feature
The Future of IoT

- More intuitive personal assistants (AI/robotics)
  - Mobility/transfer assistance
  - Bathing/ADL assistance
  - Health monitoring

- Augmented Reality
  - Virtual cueing/memory systems

- Autonomous cars
References