

Alternative Access to Mobile Technology for Computing, Communication, and Environmental Control

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Conflict of Interest Declaration



I, Emma Smith, have no relationships, financial or otherwise, which constitute a conflict of interest for this presentation.

Any references to specific products should not be considered an endorsement.

Learning Outcomes



- Describe three ways mobile technologies can be used to control the environment for individuals with disabilities
- Describe three access methods which can be used by individuals who have difficulty accessing touch interfaces
- Apply an understand of alternative access for mobile devices to three case studies

Goal



Access to environmental controls and
mobile technology for individuals with
disabilities



Possible, Exciting, Full of Potential

Outline



- What are mobile technologies
- Capabilities of mobile technologies
- Access to mobile technology
- Case Studies

What is Mobile Technology?



Capabilities of Mobile Technology

- Everyday computing
- Communication – AAC and SGD
- Environmental controls
- Health monitoring



Environmental Control Options

- Lighting
 - Bulbs
 - Switches
 - Outlet control
- Heat and Safety
 - Thermostats
 - Security systems
 - Water heaters



Environmental Control cont'd

- Doors and Windows
 - Locks
 - Door Openers
 - Doorbells
 - Blinds and Curtains
- Entertainment
 - Stereos/Speakers
 - Television/Video
 - Gaming
- Appliances
 - Slow cookers
 - Ovens
 - Fridges
 - Dishwashers



Environmental Control Integration



HomeKit

amazon echo

nest

IF

Health Monitoring

- Activity Monitoring
- Blood Pressure
- Heart Rate
- Nutrition
- Water Intake
- Sleep
- Air purification
- ...



"Typical" Access

- Touch
 - Tap
 - Swipe
 - Pinch
 - Zoom
- Voice
 - Virtual Assistants

The Issue



- Features of device designed for hand use
 - Lock screens
 - Passwords
 - Menus
- Apps not designed for alternative access

Mobile Device Access Options



- Touch
 - Direct
 - Assistive Touch
 - Stylus Use
- Mice and keyboards
- Voice
 - Siri, Google, others?
- Switches
 - iOS vs Android



Caveat...



- There are lots of features available for visual impairment
- We are not covering them... would be an entirely separate lecture
- Focus today is on physical impairment

Device Accessibility Features



- General device features may be useful
 - iOS
 - Call Audio Routing
 - LED Flash for Alerts
 - Guided Access
 - Text Replacement
 - Predictive Text
 - Restrictions
 - Auto Lock Settings
 - Android
 - High Contrast Text

What is Direct Access?



- Access to the device in the way it was intended to be used
- In Tablets:
 - Apple: Touch only
 - Android: Touch primary
 - Mouse options secondary

Why Modify Direct Access?



- More natural use of device
- Access to a wider range of apps
- Address challenges in targeting and discrete movements

Limitations of Modified Direct Access



- Difficult to do all actions
 - Multi-finger actions (pinch, zoom)
- May not address all needs
- Introduce new hardware or functions
- Big learning curve for some

Options



- Touch
 - Simple Assistive Devices (i.e. Stylus, gloves)
 - Third Party Keyboards/Keyboard Settings
 - Touch Accommodations (iOS)
 - Assistive Touch (iOS)
- Peripherals
 - Mouse
 - Keyboard

Simple Assistive Devices



- Challenge: Hand positioning
- Other fingers getting in the way
 - Hand resting on the screen

Solution: Targeted finger use

- Splints
- Gloves (cut outs, thread, glue)

Simple Assistive Devices



Challenge: Fingers not ideal, good general targeting

- Fingernails
- Angle of the fingers
- Reaction of the screen
- Positioning of the hand

Solution: Provide alternative touching device

- Stylus
- Knuckles
- Gloves

Peripherals: Keyboards



- Bluetooth keyboards may be easier to target than on-screen
- Possible to interact with the system through keyboard
- Devices available to connect ANY keyboard to ANY tablet via Bluetooth

Peripherals: Mice



- Android or Windows systems with USB
- Full mouse control of the system
- Bluetooth OR hard wired ... or interfaced
- Possible to use any mouse which works for your client
- Possible to use headmouse!

Voice Access



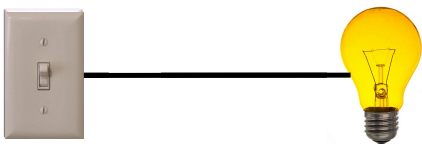
- Potential to interact with your device by speaking (requires clear voice)
- Operating system voice options
 - iOS: Siri
 - Android: Google
 - Windows: Cortana
- App specific voice options
 - Dragon

What is Switch Access?



- Control of entire device with one or more 'switches'
- Switches may be
 - Buttons
 - Levers
 - Proximity
 - Movement
 - Other sensors

How Do Switches Work?



Switch Access



- Single or multiple switch use
- Variety of switches with specific interfaces
- Ideal device depends on
 - User's capabilities
 - Intended Use



Interfaces...



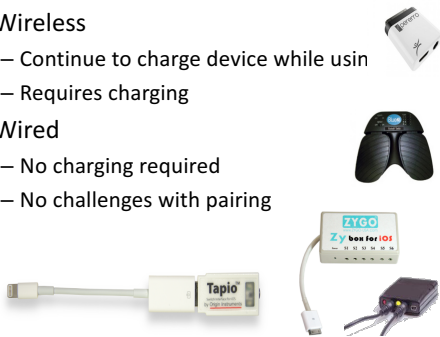
- Switches cannot plug directly into devices
- How switches 'talk' to devices
- Intermediate device



Interfaces



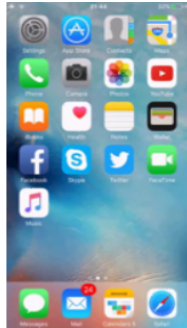
- Wireless
 - Continue to charge device while using
 - Requires charging
- Wired
 - No charging required
 - No challenges with pairing



Before You Start...



- Using the accessibility shortcut
 - Triple Click Home
 - Settings -> General -> Accessibility -> Accessibility Shortcut -> Switch Control
 - Ease of use for caregivers and clinicians



Switch Access Options



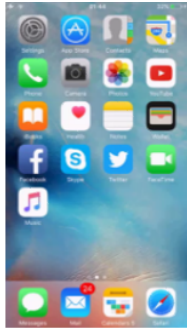
- Item scanning
 - One item at a time
 - Simple but slow
- Row-Column
 - Grouped item scanning
 - More complex, faster
- Cross-Scanning
 - Targets specific area
 - Requires most attention

Complexity and Potential

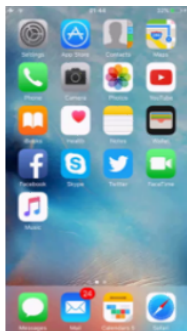


- High complexity = Great potential!
- iOS has powerful switch control tools
- KISS Principle
- It doesn't have to be complex OR difficult!

From the Complex...



To A Simple Solution...



iOS Switch Control



- iOS 10 has updated Switch Control features
 - Bluetooth vs wired switch
 - Head
 - Full screen
- Programmable through the main menu
- Scanning (row-column) or point scanning
- With or without Voiceover
- Adjustments for speed, hold length, repeat, release time



iOS Switch Settings



Switch Control ☐

Switch Control allows you to use your iPhone by sequentially highlighting items on the screen that can be activated through an adaptive accessory.

- Switches 1 >
- Recipes 1 >
- Scanning Style Auto >
- TIMING
 - Auto Scanning Time 2s >
 - Pause on First Item Off >
 - Loops 4 >
 - Move Repeat Off >
 - Long Press 1s >

- Switches
- Recipes
- Scanning Style (A/M/S)
- Timing
 - Auto Scanning Time (A)
 - Dwell Time (S)
 - Auto Hide (M/S)
 - Pause on First Item (A)
 - Loops (A)
 - Move Repeat (A/M/S)
 - Long Press (A/M/S)

iOS Switch Settings Cont'd



Tap Behavior Default >

Always Tap Keyboard Keys ☒

SWITCH STABILIZATION

Hold Duration Off >

Ignore Repeat Off >

POINT SCANNING

Gliding Cursor Speed 10 >

AUDIO

Sound Effects ☐

Speech Off >

Menu Items >

- Tap Behaviour
- Always Tap Keyboard Keys
- Switch Stabilization
 - Hold Duration
 - Ignore Repeat
- Point Scanning
 - Gliding Cursor Speed
- Audio
 - Sound Effects
 - Speech
- Menu Items

iOS Switch Settings Cont'd



Group Items ☐

Groups items for faster navigation.

VISUAL

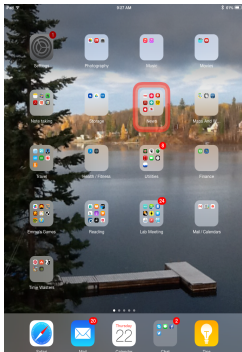
Large Cursor ☒

Cursor Color Red >

Saved Gestures None >

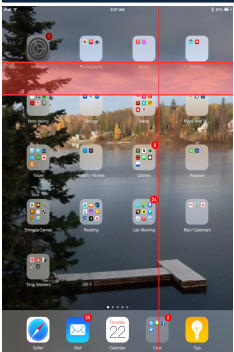
- Group Items
- Visual
 - Large Cursor
 - Cursor Colour
- Saved Gestures

iOS Item Scanning



- Row-Column or individual item scan
- Apps with discrete 'buttons'

iOS Point Scanning



- Cross-Scanning
- Improved precision
- Apps which are not 'ideal'

Why Would I Choose iOS?

- Compatibility with existing environmental controls
- Communication apps
- Mainstream nature
- The 'cool' factor
- Potential for increasing complexity with familiarity
- Consistency

Android Switch Access



- Android has integrated switch access in Lollipop 5.0.2
 - From 'Accessibility' in settings
 - Options very limited at present
- Challenges
 - Difficult to see
 - Single switch limited

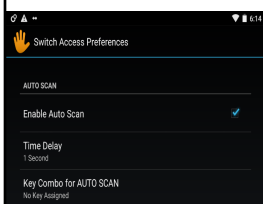


Android Benefits



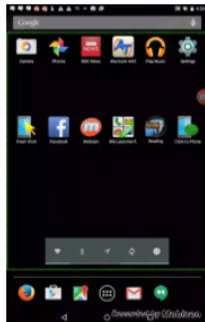
- Switch Specific Apps
- Potential for mouse use with Bluetooth connection
 - Wheelchair joystick
 - Bluetooth mouse emulators
- Use of Launchers for simplification

Android Switch Options



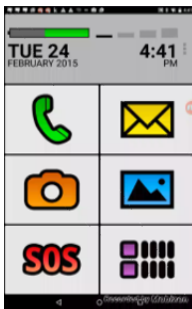
- Auto Scan
- Next
- Previous
- Click
- Long Click
- Scroll Forward
- Scroll Backward
- Back
- Home
- Notifications
- Quick Settings
- Recent Apps

Android Visual Interface



- Difficult to see
- No grouping of items
- Activation is hit/miss
- Still early...

Simplifying Android... Launchers



- Customizable
- Replaces home screen
- Free and paid versions
- Individuals who need simplification

Why would I choose Android?



- Easiest simplification
- Access to 'all in one' solution
- Potential for app development
- Cost
- Mouse Integration
 - Especially joystick users

Windows Surface Tablet Access



- USB access
 - Head Mouse access
 - Swifty
- Software
 - Dragger
 - Cross Scanner



Making it work with life...



- Not everyone who needs switch access uses a wheelchair... but many/most do
- Not everyone who needs switch access uses a powered wheelchair... some do

Mounting



- Consider type of access
- Line of sight
- Transportation needs
- Cost and available mounting options
- May be commercial or off-the-shelf

Wheelchair Integration



- Options for Bluetooth mouse or switch connection with powered wheelchairs
 - Wheelchair controls
 - External Switches
 - Combination of both

Case Study #1



- Teen with Athetoid CP
 - Lots of extraneous movement
 - Some control of hands when positioned well
- As 'normal' as possible
- Multiple switch sites
- Communication device
- Control music, camera, communication, and Facebook



Case Study #2



- Adult with C4 quadriplegia
- Sip and puff driver
- Two switch access sites on right and left sides of head
- Has voice output
- Cognitively intact
- Access to email, calendar, browser, and integration with computer



Case Study #3



- Teen with muscular dystrophy
 - Limited strength
 - Fatigues easily
- Cognitively well
- Micro-Joystick drive
- Interesting in computer programming



Resources



- AbleNet iOS Switch Guide
- Jump Start OT iOS Switch Guide
- Handsfree (Christopher Hills - iBook)
- RJ Cooper Website
- Youtube Videos

Questions?

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