

ALS and Augmentative Communication: Seeking Improved Outcomes through Early Engagement in Assessment, System Design and Implementation

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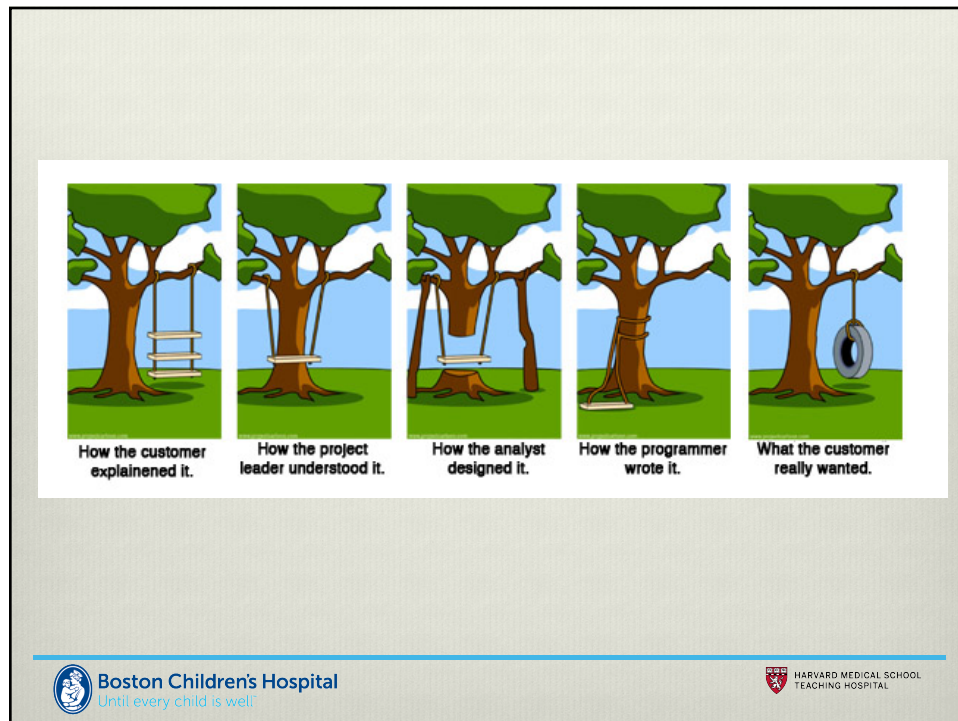
Occupational Therapy/ Assistive Technology

- ❖ Access Consideration
 - ❖ **Activity Goal**
 - ❖ Access site
 - ❖ Access method
 - ❖ Access settings
 - ❖ Real life use
 - ❖ Preparing for the next access site



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Activity Goal

- ❖ OT related – includes activities of daily living (non-communication, non-computer)
- ❖ Communication –
 - ❖ Relay quick messages – wants/needs
 - ❖ Relay novel messages
 - ❖ Participate in conversation
 - ❖ People with ALS have a lifetime of fast, sophisticated, multimodal communications

Activity Goal

- ❖ Computer –
 - ❖ Email
 - ❖ Facebook
 - ❖ Word Processing
 - ❖ Spreadsheet (often work-related)
 - ❖ Internet
 - ❖ Games
 - ❖ Movies/videos/music
 - ❖ Reading
- ❖ Smart phone or iPad
 - ❖ Phone
 - ❖ Text
 - ❖ Email
 - ❖ Games
 - ❖ Music
 - ❖ Reading



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The activity goal drives the process. Other important considerations:

- ❖ Technology availability
 - ❖ Computer at home? PC? Mac?
 - ❖ Casual user or computer whiz?
 - ❖ Somebody nearby to troubleshoot?
- ❖ Motor Control available
 - ❖ Hands? Head? Foot?
- ❖ Speech available
 - ❖ Intelligible?
 - ❖ Breath Support?
 - ❖ Fatiguing?



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HIGH TECH


Low Tech vs.

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Physical Access Control Site assessment

- ❖ Direct selection
 - ❖ Preferred method – if possible
 - ❖ Positioning/mounting
 - ❖ Adaptive stylus
 - ❖ Computer adjustments
- ❖ Indirect selection
- ❖ Best control site (s)
 - ❖ Head, eyes, mouth, tongue, respiratory (sip/puff), voice, chin, shoulder, trunk, arm/hand, leg, knee, foot.
 - ❖ Pressure, excursion, range



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Considerations for access selection:

- ❖ Motor control that is reliable and repeatable
- ❖ Motor control that is fine-tuned
- ❖ Include eye control and voice production
- ❖ Exploit the strengths and circumvent the weakness
- ❖ the range and control of movement
- ❖ the amount of training and practice required to use
- ❖ the short and long-term costs/benefits of using access method



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“He cannot use a computer. We have tried everything. He can't use his hands.”



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“I have ceded to the disease and now I type with one hand.”

NO. You are not giving into to the disease. You are outsmarting the disease and getting the job done another way.



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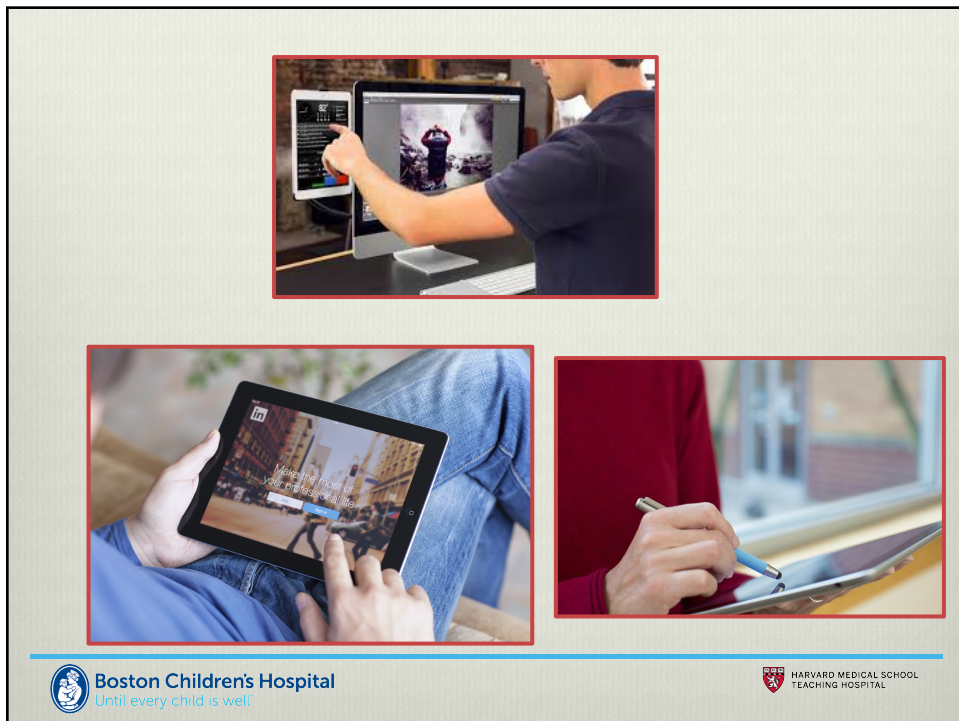
Direct Selection

- ❖ Touch screen (iPad for example)
 - ❖ Not pressure sensitive – capacitive
 - ❖ Skin (not fingernail), capacitive tip stylus
 - ❖ Timing matters – longer touch results in different action
 - ❖ One point of contact
 - ❖ Cannot drag across the screen
 - ❖ Reposition to be near body, add stylus



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Computer Access



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Direct Selection Keyboard

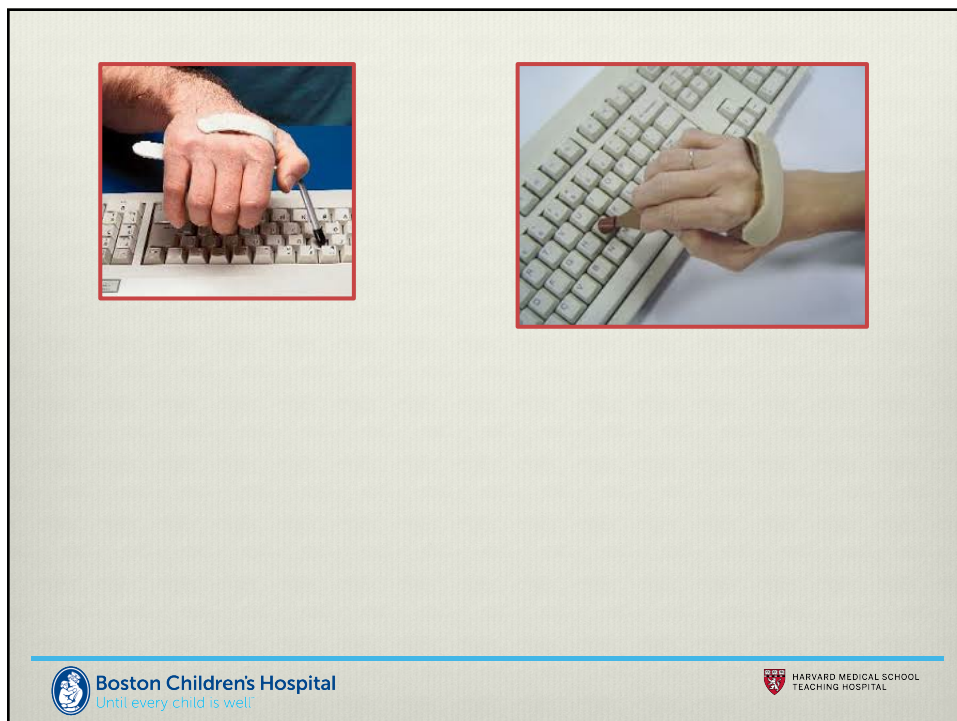
- ❖ Small keyboard
- ❖ Close to body
- ❖ Support arms/wrists
- ❖ Typing aid (pointer)
- ❖ Type with one hand
- ❖ Keyboard Adjustments – sticky keys and filter keys



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Keyboard adjustments

- ❖ Sticky keys
 - ❖ Allows the user to type keys in a row
 - ❖ Designed for one-handed typing
 - ❖ Great for poor coordination
 - ❖ Press the shift key five times to turn on
- ❖ Filter Keys
 - ❖ Adjusts for tremor or for holding the keys down too long
 - ❖ Can add key click for auditory feedback
 - ❖ April Fool's anyone?
 - ❖ Hold the right shift key for 8 seconds to turn on



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Direct Selection: Mouse

- ❖ Problem – difficulty gripping the mouse, hard to move cursor across the screen, hard to hit the left mouse button, accidentally hitting the mouse buttons
- ❖ Solution – Trackball
 - ❖ Do not need to grip – can move the ball with any part of your hand
 - ❖ Trackball remains stationary – no reaching to move it
 - ❖ Buttons are separated from the mouse movement



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- ❖ Problem – difficulty gripping the mouse, hard to move cursor across the screen, hard to hit the left mouse button, accidentally hitting the mouse buttons
- ❖ Solution – Hands-free Cursor control
 - ❖ Foot Mouse
 - ❖ Head Mouse



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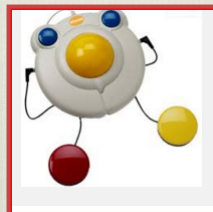
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Foot Mouse

- ❖ Foot mouse



- ❖ Trackball



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Head Mice

- ❖ Origin Instruments
- ❖ Quah Zono
- ❖ Natural Point
- ❖ Tracker Pro



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Head Mice

- ❖ All provide wireless cursor control
- ❖ All involve transmitter and receiver
- ❖ All require USB port (no Bluetooth yet)
- ❖ All require good head control
- ❖ Infrared devices require "line of sight"
- ❖ Quaha Zono is gyroscopic – no line of sight required
 - ❖ Can be programed to be used on hand or foot
- ❖ Head movement provides cursor control – need to add clicking function

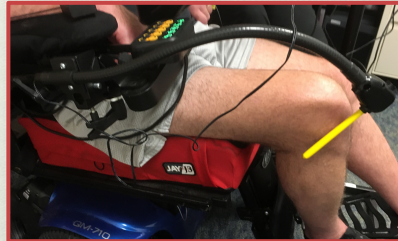


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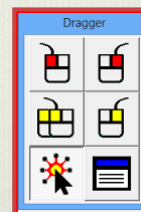
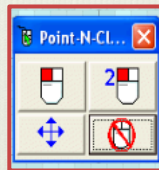
How do I click?

- ❖ Switch click
 - ❖ Any reliable switch site – except for the head.
 - ❖ Activates left click, double click, and drag



Switchless clicking

- ❖ Auto click dwell software
- ❖ Dragger
- ❖ Smart Click
- ❖ Point n Click



Set the dwell time
Set the jitter box
Have a pause button

Mouse-only access On Screen Keyboard

- ❖ Windows onscreen
- ❖ Onscreen
- ❖ Softype
- ❖ Reach Interface Author



Features:
Word prediction
Size adjustments
Built in dwell option
Macro capability

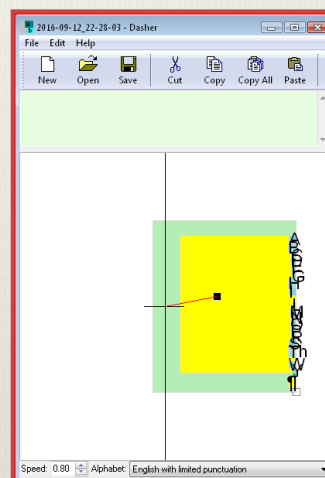


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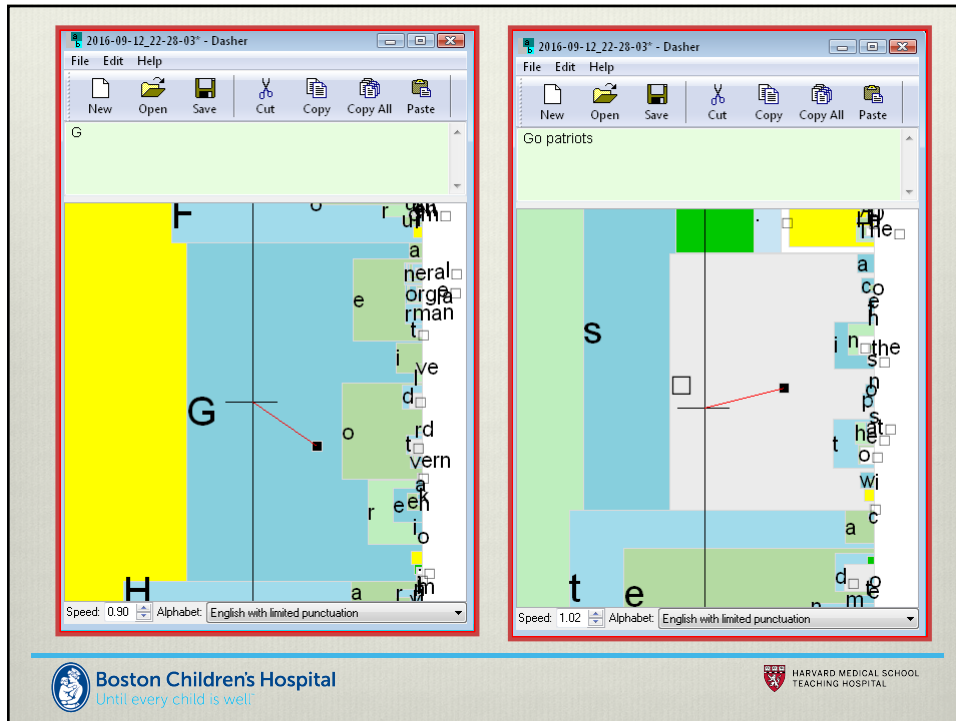
Video game style

- ❖ Dasher
 - ❖ Streaming letters
Attack of the alphabet
 - ❖ Minimal movement
 - ❖ Word and phrase prediction



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Voice input

- ❖ (Hey) Siri
- ❖ OK Google
- ❖ Alexa
- ❖ Not intended as an accommodation for a disability.
Will have difficulty with soft or dysarthric speech.
Limited Functionality
 - ❖ Siri cannot voice answer an incoming call
 - ❖ Hey Siri may require the iPhone to be plugged in

Voice input - computer

- ❖ Dragon Naturally Speaking
 - ❖ Microsoft built in voice recognition software
- ❖ Not intended as an accommodation for a disability. Will have difficulty with soft or dysarthric speech.
 - ❖ Best for word processing
 - ❖ Custom commands available (Dragon)
 - ❖ Plan for a learning curve



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- ❖ For people with limb onset ALS, voice recognition software allows them to remain connected to friends, family and the world. Voice recognition software may provide the means of remaining employed.
- ❖ Use of voice recognition software requires training and customization.
 - ❖ Adding vocabulary
 - ❖ Adding text macros
 - ❖ Adding command macros



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“Living with ALS seems a bit like going into the witness protection program. Everything I have ever known about myself, how I look, how I act, how I interact with the world, is rapidly and radically changing. When I could no longer type with my hands, I knew I could give up writing entirely or use voice recognition software. I’m not a young woman. This took real work. Interestingly, I write more now than ever before.”

Catherine Royce



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Voice mouse control

- ❖ Mouse Grid
- ❖ Move mouse up/down/right/left
 - ❖ Faster / Much Faster
 - ❖ Slower / Much Slower
 - ❖ Stop
- ❖ “Mouse click” / “Mouse double click”
- ❖ “Drag mouse up/down/right/left”



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Macros

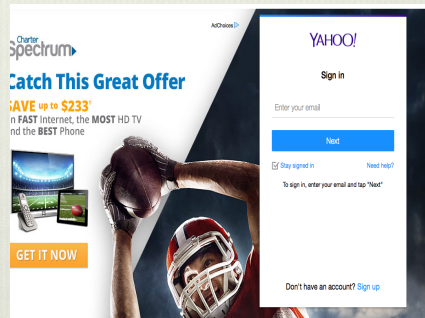
- ❖ “Peggy’s email” = Peggy.Dellea@Childrens.Harvard.edu
- ❖ “Visa Card Number” = 5808 330 2435 3319
- ❖ “Bank sign in page” =
<https://www4.citizensbankonline.com/efs/servlet/efs/login.jsp>
- ❖ “Bank password” = Give\$Me\$Money\$



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- ❖ “Check my email” =
 - ❖ Alt + D
 - ❖ <https://login.yahoo.com/config/login?.src=fpctx&.intl=us&.lang=en-US&.done=https%3A%2F%2Fwww.yahoo.com>
 - ❖ Enter
 - ❖ Wait
 - ❖ PeggyDelleaOT@yahoo.com
 - ❖ Enter
 - ❖ Wait
 - ❖ MySecretPassword
 - ❖ Enter



*Yes - this can be done with individual voice commands/typing.
But Catherine Royce once told me to “choose easy”.*



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- ❖ “Short Pier” =
 - ❖ Ctrl + A
 - ❖ Alt + O
 - ❖ F
 - ❖ Times New Roman
 - ❖ Tab
 - ❖ 8
 - ❖ Enter
 - ❖ Control + Enter



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Eye Gaze Interface – The eyes have it



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Eye Gaze

- ❖ Infrared Camera
- ❖ Position Position
Position
- ❖ Enlarged Targets
- ❖ Blink, Dwell, or
Switch clicking



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Problems

- ❖ Ptosis - camera needs to view the full pupil
- ❖ Cataracts
- ❖ Dry Eyes
- ❖ Head Movement
- ❖ Glasses and Contacts
- ❖ Pupils dilated or constricted
- ❖ Nystagmus
- ❖ Attentional deficits
- ❖ (Re) Positioning (position, position, position)



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Eye Gaze for Computer Interface

- ❖ Eye camera “bar” connects via USB
- ❖ Moves cursor across the screen
- ❖ Requires use of “gaze interaction” software



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“Reading is
huge.”



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Access to books (hardcopy or digital)

- ❖ Audio books
- ❖ Hardcopy books/ book holders
- ❖ Kindle/iBooks



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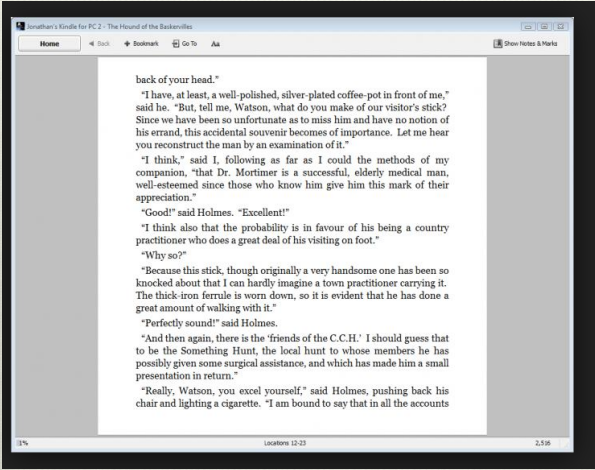
Kindle for the computer

- ❖ Free download (Amazon.com)
- ❖ Available for PC or Mac
- ❖ Out of copyright material is free
 - ❖ (free is good!)
- ❖ Simple program
 - ❖ Easy to adapt



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back of your head."

"I have, at least, a well-polished, silver-plated coffee-pot in front of me," said he. "But, tell me, Watson, what do you make of our visitor's stick? Since we have been so unfortunate as to miss him and have no notion of his errand, this accidental souvenir becomes of importance. Let me hear you reconstruct the man by an examination of it."

"I think," said I, following as far as I could the methods of my companion, "that Dr. Mortimer is a successful, elderly medical man, well-seemingly since those who know him give him this mark of their appreciation."

"Good!" said Holmes. "Excellent!"

"I think also that the probability is in favour of his being a country practitioner who does a great deal of his visiting on foot."

"Why so?"

"Because this stick, though originally a very handsome one has been so knocked about that I can hardly imagine a town practitioner carrying it. The thick-iron ferrule is worn down, so it is evident that he has done a great amount of walking with it."


"Perfectly sound!" said Holmes.


"And then again, there is the 'friends of the C.C.H.' I should guess that to be the Something Hunt, the local hunt to whose members he has possibly given some surgical assistance, and which has made him a small presentation in return."

"Really, Watson, you excel yourself," said Holmes, pushing back his chair and lighting a cigarette. "I am bound to say that in all the accounts


Click to turn page:


- Mouse
- HeadMouse
- Switch-adapted mouse
- Dwell software
- Eye Gaze interface
- Switch programmed to the right arrow key
- "Press right arrow" command
- Custom voice command (e.g. "turn page")

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“The best thing about that session was seeing his face when he was using the Kindle software.”

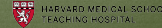
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“Shouldn’t he be doing this without the switch? He won’t be able to use the switch when the disease progresses.”



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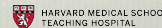
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Speech Generating Device Access

- ❖ Touch screen
- ❖ Stylus and stylus holders
- ❖ Keyboard
- ❖ Mouse
- ❖ Trackball
- ❖ Head tracking
- ❖ Adapted mouse
- ❖ Switch scanning
- ❖ Eyetracking access



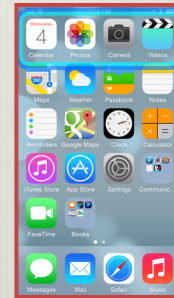
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Phone Access

- ❖ Landline options – large buttons, speaker phone
- ❖ Speaker phone options
- ❖ Smartphone use
- ❖ Hands-free cell phone use
- ❖ Switch scanning on iPhone
- ❖ Siri/ OK Google
- ❖ Mounting options



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Call system/attention signal

- ❖ Commercial wireless doorbell
- ❖ Switch-adapted attendant alarm
- ❖ Baby monitor
- ❖ Portable speech output device with or without switch



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Environmental control



- ❖ Enlarged TV remote controllers
- ❖ Switch access to TV functions, lights, fan
- ❖ Voice control for TV functions, lights, fan
- ❖ Control through SGD






- ❖ Expensive
- ❖ Learning curve
- ❖ Need to be programmed



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Brain Computer Interface (BCI)


- ❖ Projects with which we are currently affiliated:
- ❖ Oregon Health Science Project RSVP
- ❖ National Center for Adapted Neuro Technologies
Wadsworth Ctr. In Albany NY





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Brain Computer Interface

- ❖ EEG signal – surface or implanted
- ❖ Map EEG response to what is happening
- ❖ Create a program to convert EEG response to action

- ❖ Braingate
- ❖ P300



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