“The Power of Choice”

talking, computing, controlling the environment

through the power wheelchair

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Objectives

• To learn more about how to identify the client’s talking, computing, environmental control needs
• To learn more about how to identify if these needs would best be met by integrating them into the power wheelchair electronics or not
• To learn more about how the various manufacturer’s power wheelchair electronics differ

Client’s Access Method for Power Mobility

• identified most reliable and consistent access method for driving (joystick, head array, touchpad etc)
• identified most reliable and consistent “accessory switches” to control the functions of the power wheelchair (on/off, mode, reverse, tilt etc)
• considered which electronics are most appropriate for client’s literacy, vision, sensory and motor abilities
• compared various manufacturer’s power wheelchair controllers to see how they differ

Client’s Access Methods for Talking, Computing, ECU

• Identify client’s needs for other technologies (talking, computing, controlling environment)
• Aware of client’s access method for speech generating devices (SGD’s), computers, environmental controls (ECU’s)
• Consider if electronics are compatible with client’s other technologies
• Consider the pro’s & con’s to integrating these technologies into the power wheelchair

Sam

• 12 years old
• Progressive osteoheteroplasia (calcification-type disease)

Needs:

• new power wheelchair small joystick, high performance, indoor/outdoor, suspension for comfort, power tilt
• To operate wheelchair functions via small switches close together
Sam

Needs:
• Independent computer access
• Keyboard & touchpad need same location as wheelchair joystick
• Computer screen needs higher position for vision & limited neck range

Outcome:
• Preferred Invacare TDX SP for comfort, drive performance
• Computer on desk at optimal height
• TDX SP worked for mouse emulation via wheelchair joystick
• Penta Switch (on/off, drive select, mode/reset, right mouse click) via CA5 connector
• Custom mini-switch on joystick for left mouse click

Sam Summary

• Integrated power tilt & mouse emulation & ECU for TV through power wheelchair

Amadaya

• 7 years old
• Spinal Muscular Atrophy (Type 2)

Needs:
• new power wheelchair with higher performance indoor/outdoor, easy to push joystick on inner side of armrest, power tilt for posture
• To operate wheelchair functions via small switches close together & through joystick

Amadaya

Needs:
• Independent Macbook laptop access – uses built in touchpad as she can easily click, drag and drop (position computer close with armrest support)
• May need to operate mouse through wheelchair joystick in future
• Wants independent ECU (TV, DVD, infra-red toys) through wheelchair

Outcome:
• Chose Invacare TDX SP for performance
• ASL Micro-extremity joystick (driving, power tilt, ECU)
• Penta switch (on/off, drive select, mode/reset) via CA5 connector
• Laptop on flip-down mount (touchpad access with armrest support)
• Drive 1-3 (slow to fast drive speeds), Drive 4 is power tilt & ECU
Amadaya Summary

- Integrated power tilt & ECU for TV/DVD through power wheelchair
- Didn’t integrate her computer as could use touchpad on Mac laptop well

Amneet

- 12 years old
- Spinal Muscular Atrophy type 2
- HMC Mini proportional joystick
- Microlite switches – on/off, tilt
- Separate GEWA for ECU
- Laptop with touchpad

Needs:
- New power chair
- Integration of power seating, ECU and mouse access

Amneet

Outcome:
- Preferred Q-Logic electronics display
- Chose Q6 Edge
- Integrate tilt through joystick
- 2 microlites – on/off and mode
- Integrate mouse through mini proportional joystick
- 2 microlite switches for R and L mouse click

Amneet Summary

- Integrated mouse emulation and power seating
- Future integration of ECU into wheelchair – once house is wheelchair accessible

Sarah

- 19 years old
- SMA Type 2
- Ranger Compaq Express (RNET)
- HMC Mini proportional Joystick
- Integrated power tilt, ECU, Bluetooth mouse emulation
Sarah Summary

- Integrated power tilt, Bluetooth mouse emulation, ECU (TV on/off, volume & radio)
- Uses GEWA remote for TV channels, phone, front door through phone

Ron

- 52 years old
- Muscular Dystrophy
- New Quickie Experience power wheelchair (R-Net)
- Fairly good head control, minimal control left thumb
- Drives with mini-proportional joystick
- Uses microlite switch for mode, no on/off

Ron's Door Controls

- Controls condo door via ECU (infrared)
- Controls condo front door & common room using a FOB card (coded radio frequency card readers near the doors)

Ron's Phone

- Dials IR home phone via wheelchair ECU (joystick forward command)
- Uses free operator assistance to dial #
- Answers phone via wheelchair ECU (joystick reverse command)
- Wears a mic/earphone

Ron's Elevator

- Elevator controlled through wheelchair ECU
- Outside elevator button controlled via external IR transmitter (wired to wheelchair ECU)
- Inner elevator button controlled via wheelchair ECU (joystick right command scans floors & right command selects floor)
Ron
(Computer Access)

• Using a Jouse (sip’n puff mouse) which allows for advanced operation of the computer
• Sometimes uses on-screen keyboard to type with the Jouse
• Also uses I-Listen (Mac) voice recognition software to type larger messages
• He found Bluetooth mouse emulation through wheelchair joystick slow/inefficient

Ron Summary

• Integrated power seating
• Phone, condo door, elevator through external IR remote device (wired to wheelchair ECU box) – activates through joystick
• Condo main doors through FOB card/card readers
• Mainly uses sip’n puff Jouse for computer access & TV Control

Navjot

• 11 years old
• Cerebral Palsy
• Drives Invacare Power Tiger with ASL 3 switch head array
• Accesses Dynavox DV4 using head array through an external TASH mouse mover

Navjot’s Needs

• New power wheelchair, high performance indoor/outdoor, ASL 3 switch head array
• Power tilt for posture & eating/drinking
• Independent control of drives, tilt, on/off, ECU, mouse emulation
• Integrated mouse emulation for Dynavox VMax and ECU’s
Navjot Outcome

- Chose Invacare TDX SP with G-Trac
- ASL 3 switch head array, power tilt integrated through head array
- 3 extra switches to operate on/off, mode/reset, drive select
- Mouse emulation integrated through head array (left pad toggles left/right, right pad toggles up/down, back pad is mouse click)

Navjot Summary

- Integrated power tilt & mouse emulation & ECU’s through head array of power wheelchair

Tara

- 16 years old
- CP GMFCS V
- Quantum 600
- ASL head array
- Elbow switch – sustained hold to reverse
- Spec switches – on/off & mode

Needs:

- TV control
- Integrated switch for communication device

Tara Outcome

- TV through communication device
- TV through Q-Logic ECU
- R pad of head array to control communication device via input/output module

Tara Summary

- Integrated TV access via wheelchair ECU
- Integrated communication device access via wheelchair ECU
Comparison Invacare vs RNet Head Array Olivia

- 15 years
- CP GMFCS V
- Quantum Dynamo
- 3 switch mechanical head array

Needs:
- New wheelchair
- Integrated communication access

Outcome

- Invacare TDX SP
- ASL 3 switch head array
- 2 additional head switches for mode and drive select
- Mouse emulation through head array (dwell to select)
- Single switch scanning through right pad of head array

Summary

- Integrated mouse emulation for access to communication device
- Didn’t integrate ECU – easier access through Dynavox in home

Jennifer

- 18 years old
- Relapsing progressive motor polyneuropathy
- Ventilator dependent
- Has an Invacare TDX SR
- Drives with ASL 3 switch head array
- Controls mode/reset with shoulder switch
- Controls on/off with sleep

Jennifer (Computer Access)

- Controls computer with speech software with headmouse (sticker on forehead)
- Uses a second shoulder switch for mouse click

Jennifer (ECU)

- Controls ECU’s through computer with headmouse (it has GEWA software)
- GEWA remote (mounted off headrest sends IR signal to IR devices)
Jennifer Summary

- Integrated power tilt, recline & elevating legrests (ECU 1 & 2 as using non-Invacare tilt system)
- Not integrate mouse emulation (uses headmouse - sticker on forehead)
  - full directional control of mouse
  - shoulder switch for mouse click
- Not integrate ECU's through head array
  - no funding for ECU module (not included on Invacare)
  - ECU funder chose less costly GEWA remote via computer

Osmund

- 13 years old
- CP GMFCS Level V
- Pride 1103 Ultra
- Mechanical 3 switch head array
- Inverse scanning for communication device

Needs:
- New power chair
- Integrated communication access

Osmund Outcome

- Quickie Experience
- ASL 3 switch proximity head array
- 2 buddy button switches under edge of tray – 1 for reverse and 1 for profiles
- Integrated single switch scanning for communication device through back pad of head array – input/output module

Osmund Summary

- Integrated access to communication device through input/output module
- Didn’t integrate ECU – easier access through communication device in home

Ben

- 12 years old
- Cerebral Palsy (dyskinetic)
- Quantum 6000Z power wheelchair (ASL 3 switch head array)
- On/off via head array (left/right/for on)
- Reverse & profiles (speeds) via knee switch hits
- Navigates menu via head array (power tilt, photos, ECU’s, mouse emulation)
- He is literate, non-verbal

Ben (Mouse Emulation)

- Unable to use Bluetooth mouse emulation due to its permanent acceleration and accidental L/R mouse clicks
- Uses an Intelliswitch (wired to ECU) to move mouse on Dynavox VMX
  - Left pad is left
  - right pad is right
  - back pad is up using screen wrap
  - separate head switch for mouse click
Ben Dynavox & Computer Use

- Uses Dynavox Vmax to send spelled words (infrared transmission) to desktop computer
- This is done via a Dynavox “Access IT” receiver (plugs into USB)
- Uses Kurzweil 3000 software program (allows for fill-in-the-blanks input)

Ben Summary

- Integrated power tilt & some ECU’s (infrared from power wheelchair)
- Some ECU control using infrared on Dynavox VMax)
- Prefers mouse emulation using Intelliswitch wired to chair instead of the Bluetooth mouse in power wheelchair

Pro’s to Integrating

- Only requires one access method
- Less equipment on the power wheelchair
- May be less expensive
- Portability
- May increase independence

Con’s to Integrating

- Power wheelchair access method may not be the best access for other technologies
- If the power wheelchair breaks down, client loses access to technologies
- May not be able to access other technologies from manual wheelchair
- May be more expensive
- May be more confusing or complex to understand

Integrating vs Not Integrating

- Most of our clients seem to prefer power seating & ECU functions to be integrated
- Many clients also prefer to have ECU’s operated from manual wheelchair or bed (not-integrated)
- Many of our clients don’t prefer integrated mouse emulation - (important to identify best computer/SGD access method)
Comparison of Invacare, Quantum (Pride), R-Net Electronics

Invacare

Pro's:
• graphics in menu don't require reading skills
• easy to program SGD's & computers & ECU's
• easy for joystick user to navigate on the joystick's built-in visual display
• Mouse emulation very reliable (doesn't accelerate)
• Able to program speed, acceleration and drag latch
• Radio-frequency dongle provided with mouse emulator
• External switch ports for mouse clicks

Con's:
• Some graphics are small & abstract (difficult to understand)
• Compact joystick users need additional switches for on/off, mode
• Head array users need additional switches for on/off, mode
• ECU and mouse emulation are not built-in (needs to be purchased separately)
• Note: don't use sleep mode/standby in mouse emulation
• ECU navigation slow – only L/R commands

Pride (Quantum)

Pro's:
• Large colourful graphics, has photos
• Ability to have integrated access to SGD's, computers, ECU's
• Has ECU and Bluetooth mouse emulation built into enhanced visual display
• Compact joystick users only need one additional switch for mode or no extra switches if use time-out feature
• Head Array users need only one extra switch for mode or no extra switches if using timeout feature or a series of head array sequenced hits

Con's:
• Joysticks with built-in visual displays don't have Infrared or Bluetooth (need enhanced visual display)
• Visual display navigation requires reading abilities
• Scrolls up from the bottom of display
• Difficult to setup Infrared ECU's and Bluetooth mouse (done through PC computer program)
• Mouse mover has permanent acceleration
• Note: don't use time-out if using mouse emulation

• Many need another switch for reverse (quick tap of the back pad for reverse can be accidental and a safety risk)
• Forward/Reverse arrows are small (difficult to see)
• Left or right mouse clicks always occur with 2 hits of head array pads (pro or con)
• ECU's can alter how the head array works (alters which head pad you need to navigate)
R-Net

Pro’s:
• Large colourful graphics
• Can simplify text & graphics for limited reading ability (if each profile contains one function)
• Can integrate SGD’s & computers & ECU’s
• Infrared is built into OMNI visual display
• Easy for joystick user to navigate on the joystick’s built-in visual display
• Compact joystick or head array users only need one additional switch for mode (or no extra switches if use
time-out feature or sequenced head array hits)
• Mouse emulation has many adjustments for joystick users

R-Net

Con’s:
• Need to program ECU’s & mouse emulation using dealer PC or
  Mac computer software
• Bluetooth mouse emulation is not built-in (purchased
  separately)
• Mouse emulator has permanent acceleration feature
• Note: don’t use time out if using mouse emulation
• No option for external switches for mouse clicks – joystick
  users can use ‘nudge’ but non joystick users need to use
  external switch interface or dwell software
• Many need another switch for reverse (quick tap of the back
  pad for reverse can be accidental and a safety risk)