Be an AT Quant!

(Fun and Excellence through the Use of Data)

Heidi Koester, Ph.D.
hhk@kpronline.com
Koester Performance Research, Ann Arbor, MI
www.kpronline.com

Carmen DiGiovine, Ph.D., ATP/SMS, RET
carmen.digiovine@osumc.edu
Assistive Technology Center
The Ohio State University, Columbus, OH

William Wenninger, MS, PT
Bill.Wenninger@va.gov
Office of Rehabilitation and Prosthetics Services
VA Central Office, Washington DC

Overview – Be an AT Quant!

- Brief introduction
- Use of evidence in computer access and AAC
- Tools for data collection in seating and mobility
- All-purpose outcome measurement tools

A (brief) tale of quants and pundits

- Election 2012: "So the quants and their statistical models were right, while the pundits and their guts were wrong."
- AT, like political strategy, includes this combination of, and sometimes tension between, art and science, opinion and facts, intuition and evidence.

http://chronicle.com/blogs/percolator/the-poll-quants-won-the-election/31722

Today's Goal

- Introduce some quant seasoning to AT service delivery…
  - See what value that might add
  - And how difficult/easy it might be

Types of Evidence

- Observation
- User Feedback
- **Measurement**

Quant Evidence – example uses

- Setting goals: therapy, IEP, etc.
  - Identifying needs
  - Justifying areas of work
- Funding support
- Choosing methods and techniques
- Optimizing configuration
- Tracking progress
- Measuring outcomes

At 2:00, you tell us:

- Is taking measurements painful?
- If so, is the gain worth the pain?

Tools for Computer Access Measurement

- Assess user abilities that are most relevant to computer usage
- Speed and accuracy during performance of specific fundamental tasks, such as:
  - Text entry
  - Target selection
  - Target dragging
  - Switch press

Computer-based Measurement Tools

- Present tasks that are repeatable, relevant, and realistic
- Efficient data collection and report generation
- Ideally – get the information you need, in less time!
- Focus on KPR software, but will mention other options

Data for Text Entry

- Using keyboard or alternatives such as on-screen keyboard, speech recognition, scanning
- Some external evidence exists
- Gather internal evidence about the user:
  - Choose the best text entry method
  - Configure the text entry method
  - Track progress

Skills & Measures for Text Entry

- Reliable and efficient access to all characters and functions
- Words (or characters) per minute
  - overall and with errors removed
- Errors
- Complements observations and feedback

Gathering Text Entry Evidence

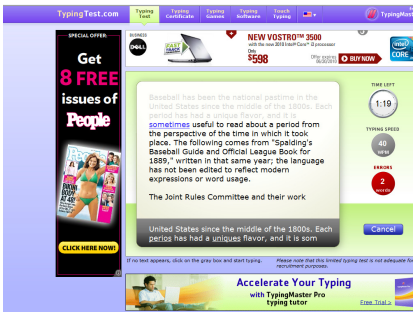
- List of tools:
  - “Standard” typing tests
  - TextTest and StreamAnalyzer
  - Compass software
  - Keyboard Wizard

Free Typing Tests

- TypingTest.com
- speedtest.10-fast-fingers.com

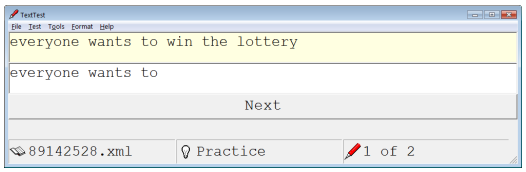
- Typical limitations:
  - Distracting screen
  - One size fits all
  - Can't save results
  - Psychometric validity unknown

Example of distractions, in TypingTest.com



TextTest and Stream Analyzer

- faculty.washington.edu/wobbrock
- Free, HCI research tool
- Practice and test modes
- Two included phrase sets or create a custom set



StreamAnalyzer

```
Num Testing? Time WPM AdjWPM CPS KSPS GPS Intra Inter StrDist M
1 0 34.188 11.583 11.293 0.965 1.258 1.293 0.6309546 0.1598864
2 1 21.532 14.49 13.997 1.208 1.393 1.489 0.531258 0.1834839 1
```

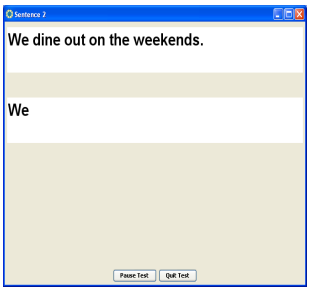
- Trial number
- Test or practice
- Total time for trial
- WPM
- WPM adjusted with errors
- Characters per second
- Keystrokes per second
- Gestures per character
- Average time per character
- Average time between characters
- Plus 24 more

Compass Software

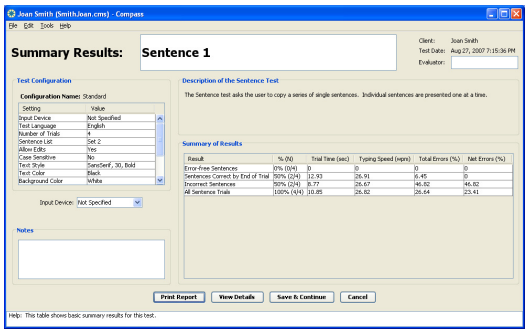
- Letter, word, and sentence tests specifically for text entry skills
- Setup is highly customizable, if desired
- Validity has been demonstrated
- Compatible with alternative inputs and outputs
- Reports and data are stored for easy review and retrieval

Compass Sentence Test

- Compatible with alternative text entry methods
- Adjustable font, size, text difficulty, feedback, etc.
- Accurate and valid measurements



Compass Sentence Report



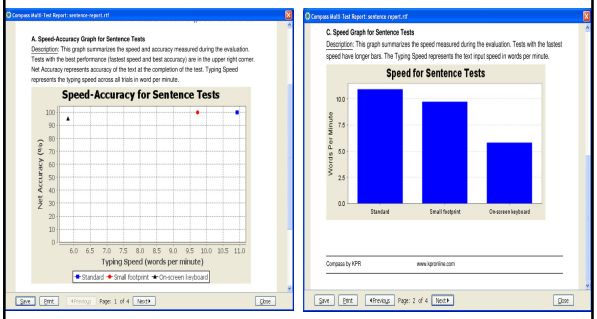
Compass Sentence Report

Summary of Results

Result	% (N)	Trial Time (sec)	Typing Speed (wpm)	Total Errors (%)	Net Errors (%)
Error-free Sentences	0% (0/4)	0	0	0	0
Sentences Correct by End of Trial	50% (2/4)	12.93	26.91	6.45	0
Incorrect Sentences	50% (2/4)	8.77	26.67	46.82	46.82
All Sentence Trials	100% (4/4)	10.85	26.82	26.64	23.41

- Typing Speed, wpm
- Comparing Total and Net Errors shows how well user could identify and fix mistakes.

Compass Comparison Report

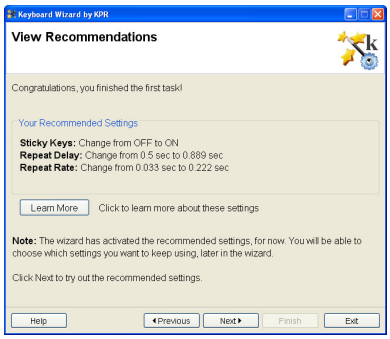


Keyboard Wizard

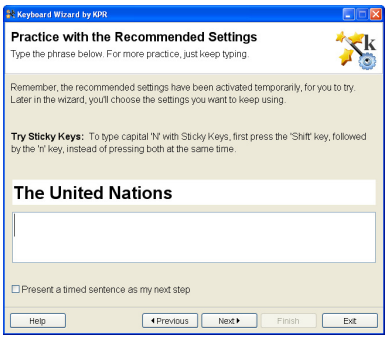
- To establish Sticky Keys and repeat settings

1. Type a sentence

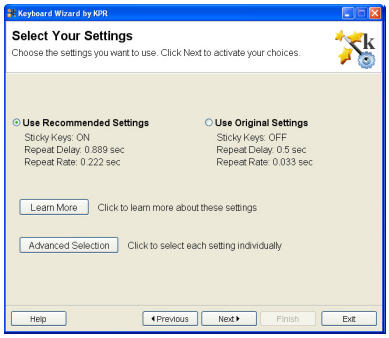
2. Get recommendations, based on how you typed.



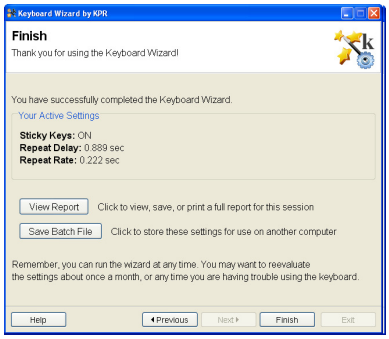
3. Try out the new settings



4. Pick the ones you want



5. Keyboard Wizard activates your choices for you



Text Entry Example

- 68 y/o woman with multiple sclerosis
- Runs through Keyboard Wizard
- Adjusting auto-repeat setting:
  - Improved typing speed 50% (from 2.2 to 3.2 wpm)
  - Reduced errors 32 pp (from 60% errors to 28%)

Data for Pointing Device Use

- Select best pointing method
  - Mice, trackballs, trackpads, head-controlled mice, keyboard-based approaches, etc.
- Configure for user's needs
  - Location, splinting, device behavior, etc.
- Follow-along

- Very little external evidence available

Skills & Measures for Pointing

- Target Acquisition
  - Dwell, click, double-click
- Dragging
- Menu Selection

- Speed & accuracy
- Complements observations & feedback

Gathering Pointing Device Evidence

- Research-based tools:
  - Compass software
  - Pointing Wizard
  - Assessment of Computer Task Performance (paper-and-pencil protocol)

Compass Software

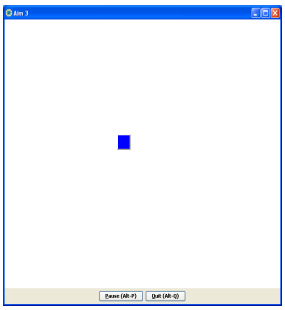
- Aim, Drag, and Menu tests specifically for pointing device skills
- Assess on-screen keyboard use with text entry tests
- Setup is highly customizable, if desired
- Validity has been demonstrated
- Compatible with alternative inputs and outputs
- Reports and data are stored for easy review and retrieval

Compass Example

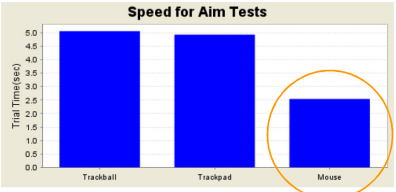
- Selecting the best pointing device for an individual with upper extremity impairments
- Young adult with CP performed Compass Aim tests with three different pointing devices
- Test set-up was identical for each device

Compass Aim Test

- Measures speed and accuracy of user's target selections
- Reports averages across targets, as well as target-by-target data



Compass Example: Results



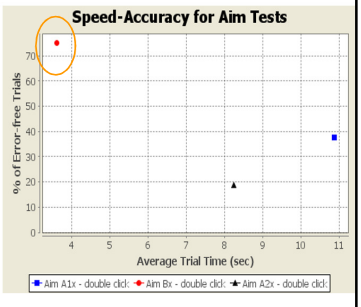
- Control looked similar, qualitatively
- But performance was much faster with the mouse
- Provides team (including user) with means of making an informed decision

Pointing Wizard Example

- Adjusting Windows settings to meet a user's needs
- Pointer speed: gain of the pointing device
- Double-click settings:
  - Double-click time
  - Double-click distance
- Object sizes: menus, caption buttons, scrollbar, taskbar

Pointing Wizard Example

- Woman post brain tumor
- Results with new settings:
  60% faster
  50% fewer clicks
  (relative to default)
- Last 12 people tested averaged 30% improvement



Data for Switch Use

- Select best switch
  - Location
  - Activation method
- Configure scanning software
  - Scan rate
- Compass or SSPT for gathering evidence

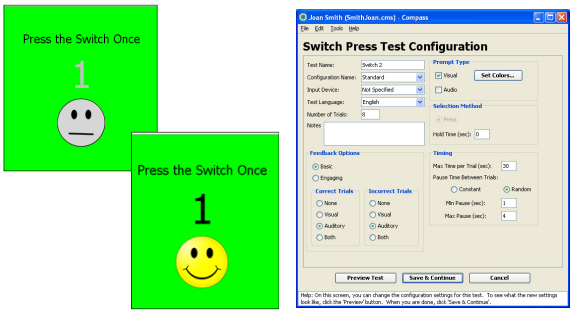
Skills & Measures for Switch Use

- Reliable and efficient switch press
- Press time
- Release time
- Errors (extra switch hits)
- Complements observations and feedback

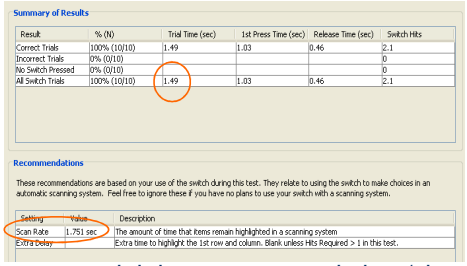
Single Switch Performance Test

- Free from www.aacinstitute.org
- Three Tests
  - Activation
  - Release
  - Repetition
- Limited configuration and reporting

Compass Switch Press Test



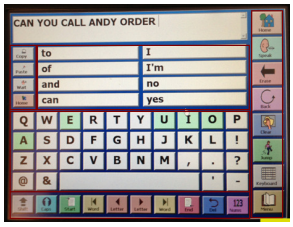
Compass Switch Report



- Compare trial times across switches/sites
- Determine appropriate scan rate

Enhancing Single-switch Scanning

- 50 year-old man with cerebral palsy
- 5-group scanning display on his AAC system
- Use Compass Switch to define better scan rate



Enhancing Single-switch Scanning

- Original scan rate = 1.3 sec; Switch hit time = 1.5 sec
- User can't reliably select items within available time

Condition	Scan Rate (sec)	Errors/correct sel'n	TER (wpm)
Original	1.3	2.3	0.28
Revised	1.9	0.33	1.15

- Slower scan rate, better letter layout, lower loop count combine to yield **300% improvement** in TER

Summary So Far

- Clear Evidence, Better Solutions
- Compass: for assessment, more formal evidence-gathering
- Keyboard and Pointing Wizards: tools for end user to leverage Windows settings effectively

KPR Software Details

- Resources at KPR website, kpronline.com
  - Compass, Win/Mac, $179
  - Wizards, Win, $16.95 each
  - Compass + Wizards bundle, $195
  - Free trial of Compass available
  - Demonstration videos
- Compass also available through Infogrip, EnableMart, and Technology for Education

Questions?

Measurement Tools

- Functional Mobility Assessment (FMA)
  - AKA Functioning Everyday in a Wheelchair (FEW)
- Quebec User Evaluation of Satisfaction with assistive Technology (QUEST)
- Wheelchair Skills Test (WST)
- Psychosocial Impact of Assistive Devices (PIADS)

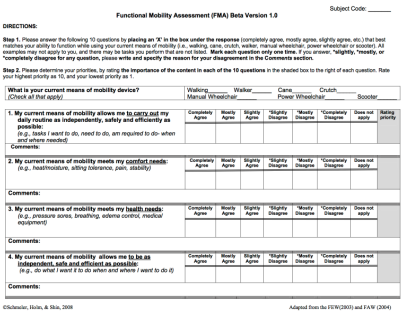
QUEST - Demers et al. (1996)
FMA - Mills et al. (2002)
WST – Kirby et al. (2002)
PIADS – Day et al. (2002)

Quality Assurance - Assistive Technology Center at The Ohio State University Wexner Medical Center

FMA

- Mobility only
- Does not require experience with a device
- 10 items
  - Carry out daily routine
  - Comfort needs
  - Health needs
  - Independent, safe, and efficient
  - Tasks at different surface heights
  - Ability to transfer
  - Personal care tasks
  - Indoor mobility
  - Outdoor mobility
  - Transportation

FMA



Subject Code: _____

Functional Mobility Assessment (FMA) Beta Version 1.0

DIRECTIONS:

Step 1. Please answer the following 10 questions by **placing an 'X' in the box under the response** (completely agree, mostly agree, slightly agree, etc.) that best matches your ability to function while using your current means of mobility (i.e., walking, cane, crutch, walker, manual wheelchair, power wheelchair or scooter). All examples may not apply to you, and there may be tasks you perform that are not listed. **Mark each question only one time.** If you answer, **"slightly," "mostly," or "completely disagree for any question, please write and specify the reason for your disagreement in the Comments section.**

Step 2. Please determine your priorities, by rating **the importance of the content in each of the 10 questions** in the shaded box to the right of each question. Rate your highest priority as 10, and your lowest priority as 1.

What is your current means of mobility device? (Check all that apply)	Walking_____ Walker_____ Cane_____ Crutch_____ Manual Wheelchair_____ Power Wheelchair_____ Scooter_____						
1. My current means of mobility allows me to carry out my daily routine as independently, safely and efficiently as possible: (e.g., tasks I want to do, need to do, am required to do- when and where needed)	Completely Agree	Mostly Agree	Slightly Agree	*Slightly Disagree	*Mostly Disagree	*Completely Disagree	Does not apply	Rating priority
Comments:								
2. My current means of mobility meets my comfort needs: (e.g., heat/moisture, sitting tolerance, pain, stability)	Completely Agree	Mostly Agree	Slightly Agree	*Slightly Disagree	*Mostly Disagree	*Completely Disagree	Does not apply	
Comments:								
3. My current means of mobility meets my health needs: (e.g., pressure sores, breathing, edema control, medical equipment)	Completely Agree	Mostly Agree	Slightly Agree	*Slightly Disagree	*Mostly Disagree	*Completely Disagree	Does not apply	
Comments:								
4. My current means of mobility allows me to be as independent, safe and efficient as possible: (e.g., do what I want it to do when and where I want to do it)	Completely Agree	Mostly Agree	Slightly Agree	*Slightly Disagree	*Mostly Disagree	*Completely Disagree	Does not apply	
Comments:								

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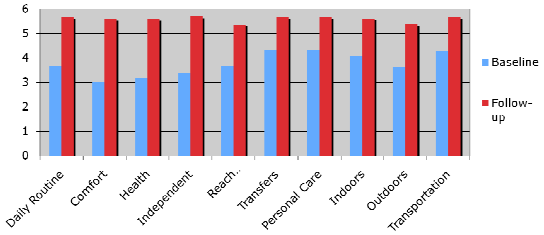
FMA: Scoring

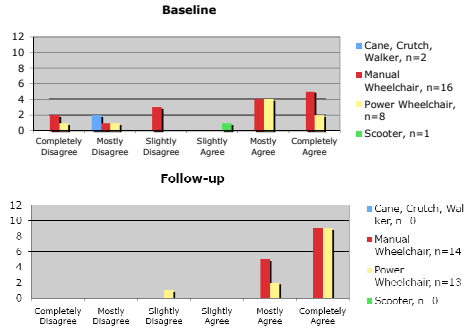
- 1: completely disagree
- 2: mostly disagree
- 3: slightly disagree
- 4: slightly agree
- 5: mostly agree
- 6: completely agree

FMA: Pre/Post, n=27

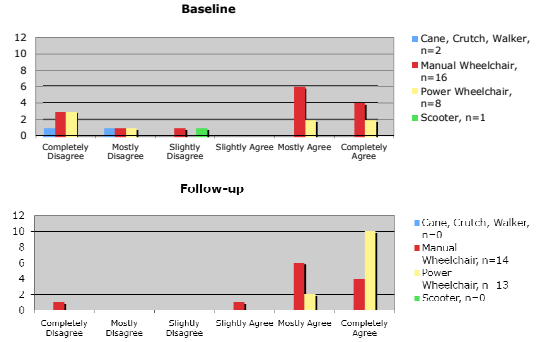


1: completely disagree, 2: mostly disagree, 3: slightly disagree, 4: slightly agree, 5: mostly agree, 6: completely agree

FMA: Indoors by Device (n=27)



FMA: Outdoors by Device (n=27)



Quality Assurance at the Department of Veterans Affairs - Polytrauma Rehabilitation Centers – Assistive Technology Labs: Palo Alto, CA and Richmond, VA

QUEST

- All assistive technology
- Requires that you already have a device
- 12 items: 8 device, 4 service
  - **Device**: dimensions, weight, ease in adjusting, safe and secure, durability, easy to use, comfortable, effective
  - **Service**: service delivery, repairs and servicing, professional services, follow-up services

QUEST

Quebec User Evaluation of Satisfaction with assistive Technology

QUEST (Version 2.0)

Technology device: _____

User name: _____

Date of assessment : _____

The purpose of the **QUEST** questionnaire is to evaluate how satisfied you are with your assistive device and the related services you experienced. The questionnaire consists of 12 satisfaction items.

- For each of the 12 items, rate your satisfaction with your assistive device and the related services you experienced by using the following scale of 1 to 5.

1	2	3	4	5
Not satisfied at all	Not very satisfied	More or less satisfied	Quite Satisfied	Very satisfied

- Please circle or mark the **one number** that best describes your degree of satisfaction with each of the 12 items.
- **Do not** leave any question unanswered.
- For any item that you were not "very satisfied", please comment in the section ***comments***.

Thank you for completing the QUEST questionnaire.

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1	2	3	4	5
Not satisfied at all	Not very satisfied	More or less satisfied	Quite Satisfied	Very satisfied

ASSISTIVE DEVICE

How satisfied are you with...

1. the **dimensions** (size, height, length, width) of your assistive device? *Comments:*	1 2 3 4 5
2. the **weight** of your assistive device? *Comments:*	1 2 3 4 5
3. the **ease in adjusting** (fixing, fastening) the parts of your assistive device? *Comments:*	1 2 3 4 5
4. how **safe and secure** your assistive device is? *Comments:*	1 2 3 4 5
5. the **durability** (endurance, resistance to wear) of your assistive device? *Comments:*	1 2 3 4 5
6. how **easy** it is to use your assistive device? *Comments:*	1 2 3 4 5
7. how **comfortable** your assistive device is? *Comments:*	1 2 3 4 5
8. how **effective** your assistive device is (the degree to which your device meets your needs)? *Comments:*	1 2 3 4 5

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QUEST: Scoring

- 1: not satisfied at all
- 2: not very satisfied
- 3: more or less satisfied
- 4: quite satisfied
- 5: very satisfied

QUEST

- Top 3: Importance

- Below is the list of the same 12 satisfaction items. PLEASE **SELECT THE THREE ITEMS** that you consider to be **the most important to you**. Please put an X in the **3 boxes** of your choice.

☐	1. Dimensions	☐	7. Comfort
☐	2. Weight	☐	8. Effectiveness
☐	3. Adjustments	☐	9. Service delivery
☐	4. Safety	☐	10. Repairs/servicing
☐	5. Durability	☐	11. Professional service
☐	6. Easy to use	☐	12. Follow-up services

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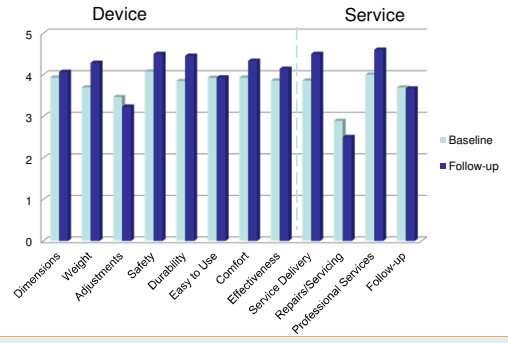
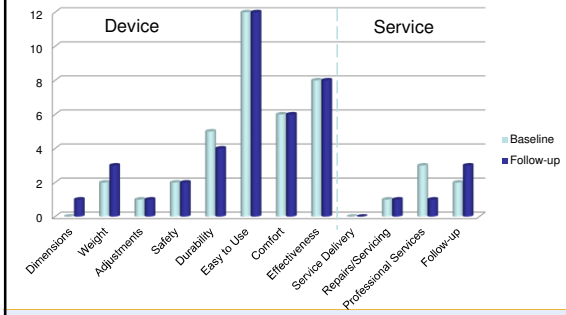
QUEST – AAC – Palo Alto (n=15)

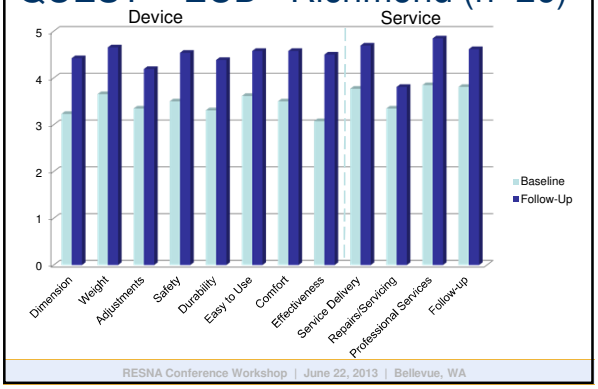


QUEST – AAC – Palo Alto (n=15)

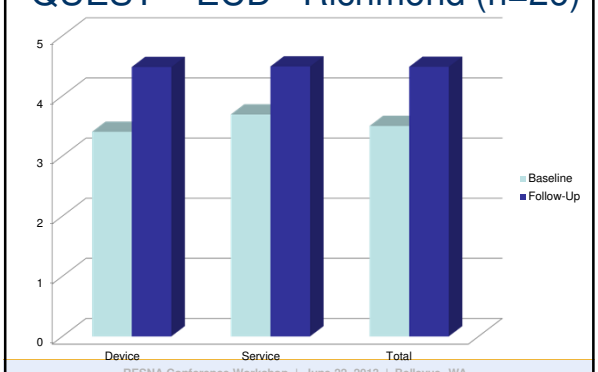
QUEST – AAC – Importance (Top 3) – Palo Alto



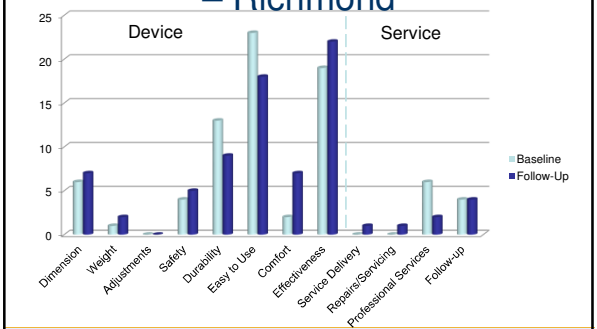
QUEST – ECD– Richmond (n=26)



QUEST – ECD– Richmond (n=26)



QUEST – ECD– Importance (Top 3) – Richmond



Uses of Outcome Measures

- Quality Assurance
- Program Managers
- Practitioners

Quantitative Measures – Wheelchair Clinic at The Ohio State University Wexner Medical Center

Treatment – Case Study

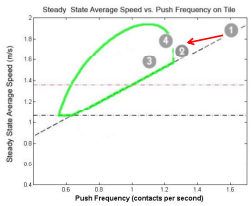
- SmartWheel
- Wheelchair Skills Test
- Photos
- Level Belt

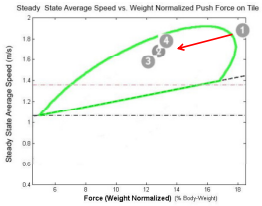



Photos and Level Belt



Propulsion Analysis with SmartWheel



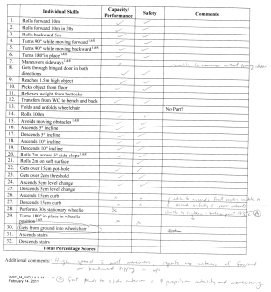


Training and Feedback decreases frequency and decreases force

WST

- Mobility only
- Requires that you have a wheelchair
- 32 Items – 2 forms (MWC, PWC)
  - MWC
    - Rolls forward 10 m
    - Roles backward 5 m
    - Rolls 100m
    - Ascends 5 cm level change
    - Etc.
  - PWC
    - Moves controller away and back
    - Turns controller on and off
    - Selects drive modes and speeds
    - Etc.

Wheelchair Skills Test



-Unable to maneuver sideways
-Not safe to independently ascend 15 cm with rear wheels.
-Unable to maintain wheelie
-Balance point – Caster 10.5" off of floor

Lessons Learned

- Numerous tools that are simple, easy and non time consuming
- Need to have equipment readily available prior to appoint
- Development of goals and plan of care
- Clients appreciate level of evaluation
- Raises clients awareness of interaction with seating and mobility system

Questions?

Conclusions

- Quant can be cool! And effective!
- Clients themselves often really appreciate seeing data about their performance
- Give one of these tools a try, if you haven't already

Final Words

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- Heidi Koester, hhk@kpronline.com
- Carmen DiGiovine, carmen.digiovine@osumc.edu
- Bill Wenninger, bill.wenninger@va.gov

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