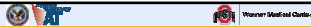


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Be an AT Quant!

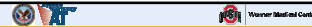
(Fun and Excellence through the Use of Data)

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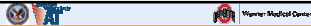
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Overview – Be an AT Quant!

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

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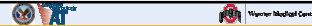
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A (brief) tale of quants and pundits


- 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>

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Today's Goal




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

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Types of Evidence

- Observation
- User Feedback
- **Measurement**



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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

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At 2:00, you tell us:

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

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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

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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

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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

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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

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Gathering Text Entry Evidence

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

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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

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Example of distractions, in TypingTest.com

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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

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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

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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

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Compass Sentence Test

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

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Compass Sentence Report

Client: Joan Smith
Test Date: Aug 25, 2007 7:05:26 PM
Evaluator:

Summary Results: Sentence 1

Test Configuration

Configuration Name: Standard

Setting: value

Input Device: Not Specified

Test Language: English

Number of Trials: 2

Sentence List: 1

Allow Edit: Yes

Case Sensitive: No

Send Score: No

Test Style: Standard

Test Color: Black

Background Color: White

Input Device: Not Specified

Description of the Sentence Test

The Sentence test asks the user to copy a series of single sentences. Individual sentences are presented one at a time.

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

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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.

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Compass Comparison Report

A. Speed-Accuracy Graph for Sentence Tests

Description: This graph summarizes the speed and accuracy measured during the evaluation. Tests with the best performance (best speed and best accuracy) are in the upper right corner. Net Accuracy represents accuracy of the test at the completion of the test. Typing Speed represents the typing speed across all trials and per minute.

Speed-Accuracy for Sentence Tests

Typing Speed (words per minute)

Net Accuracy (%)

Standard Small Font On-Screen Keyboard

C. Speed Graph for Sentence Tests

Description: This graph summarizes the speed measured during the evaluation. Tests with the fastest speed have longer bars. The Typing Speed represents the test input speed in words per minute.

Speed for Sentence Tests

Words per Minute

Standard Small Font On-Screen Keyboard

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Keyboard Wizard

- To establish Sticky Keys and repeat settings

- Type a sentence

Keyboard Wizard by KPR

Type a Sentence

Type the sentence exactly as shown. Click Next when you are done.

The Red River may flood Northern Texas!

the Red Riv

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2. Get recommendations, based on how you typed.

Keyboard Wizard by KPR

View Recommendations

Congratulations, you finished the first task!

Your Recommended Settings

Sticky Keys: Change from OFF to ON
Repeat Delay: Change from 0.5 sec to 0.889 sec
Repeat Rate: Change from 0.033 sec to 0.222 sec

Learn More Click to learn more about these settings

Note: The wizard has activated the recommended settings, for now. You will be able to choose which settings you want to keep using, later in the wizard.

Click Next to try out the recommended settings.

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3. Try out the new settings

Keyboard Wizard by KPR

Practice with the Recommended Settings

Type the phrase below. For more practice, just keep typing.

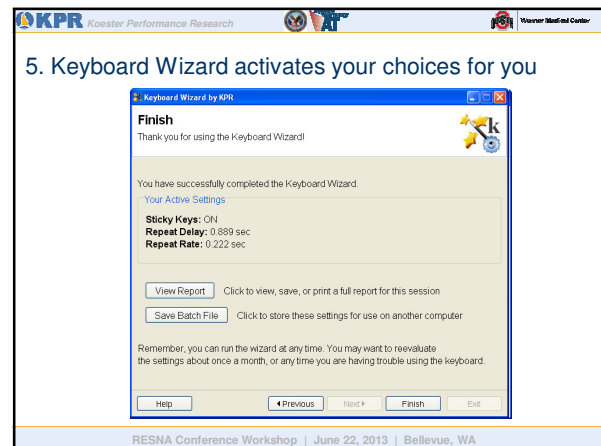
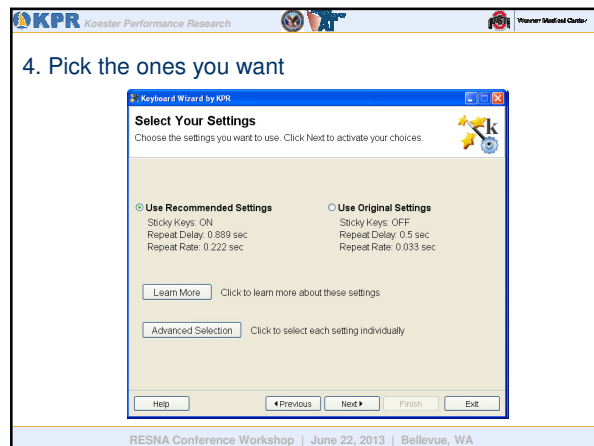
Remember, the recommended settings have been activated temporarily, for you to try. Later in the wizard, you'll choose the settings you want to keep using.

Try Sticky Keys: To type capital 'N' with Sticky Keys, first press the 'Shift' key, followed by the 'n' key, instead of pressing both at the same time.

The United Nations

☐ Present a timed sentence as my next step

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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%)

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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

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Skills & Measures for Pointing

- Target Acquisition
 - Dwell, click, double-click
- Dragging
- Menu Selection
- Speed & accuracy
- Complements observations & feedback

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Gathering Pointing Device Evidence

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

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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

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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

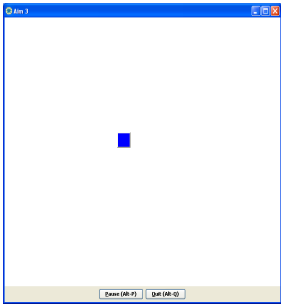
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Compass Aim Test

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

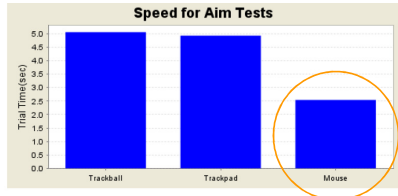


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Compass Example: Results



Device	Trial Time (sec)
Trackball	~4.8
Trackpad	~4.8
Mouse	~2.8

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

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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

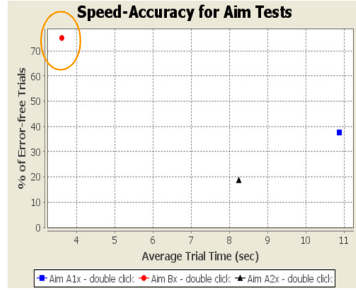
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Pointing Wizard Example

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



Condition	Average Trial Time (sec)	% of Error-free Trials
Aim A1x - double cld	~10.8	~38
Aim Bx - double cld	~4.2	~70
Aim A2x - double cld	~8.2	~20

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Data for Switch Use

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

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Skills & Measures for Switch Use

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

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Single Switch Performance Test

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

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Compass Switch Press Test

Press the Switch Once
1

Press the Switch Once
1

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Compass Switch Report

Summary of Results

Result	% (N)	Trial Time (sec)	1st Press Time (sec)	Release Time (sec)	Switch Hits
Correct Trials	100% (10/10)	1.49	1.03	0.46	2.1
Incorrect Trials	0% (0/10)				0
No Switch Pressed	0% (0/10)				0
All Switch Trials	100% (10/10)	1.49	1.03	0.46	2.1

Recommendations

These recommendations are based on your use of the switch during the test. They relate to using the switch to make choices in an automatic scanning system. Feel free to ignore these if you have no plans to use your switch with a scanning system.

Setting	Value	Description
Scan Rate	1.751 sec	The amount of time that items remain highlighted in a scanning system
Extra Delay		Extra time to highlight the 1st row and column. Blank unless Hits Required > 1 in this test.

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

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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

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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


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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


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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

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Questions?

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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)

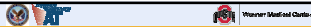
QUEST - Demers et al. (1996)
 FMA - Mills et al. (2002)
 WST - Kirby et al. (2002)
 PIADS - Day et al. (2002)

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

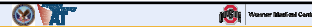
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FMA

- 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

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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 describes your ability to perform when using your current means of mobility (i.e., walking cane, crutch, walker, manual wheelchair, power wheelchair or scooter). All responses 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 prioritize 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)

	Walker	Walker	Cane	Crutch	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., I expect 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
Comments:						
2. My current means of mobility meets my comfort needs (e.g., backrests, sitting surfaces, push, etc.).	Completely Agree	Mostly Agree	Slightly Agree	Slightly Disagree	Mostly Disagree	Completely Disagree
Comments:						
3. My current means of mobility meets my health needs (e.g., pressure areas, sweating, skin care, medical equipment).	Completely Agree	Mostly Agree	Slightly Agree	Slightly Disagree	Mostly Disagree	Completely Disagree
Comments:						
4. My current means of mobility allows me to be as independent, safe and efficient as possible (e.g., do what I want to do when and where I want to do it).	Completely Agree	Mostly Agree	Slightly Agree	Slightly Disagree	Mostly Disagree	Completely Disagree
Comments:						

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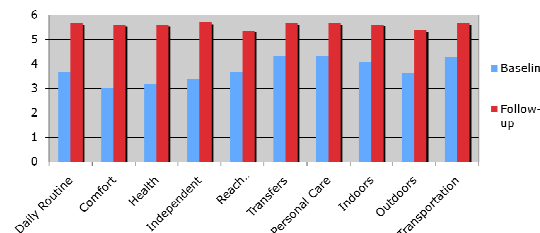
FMA: Scoring

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

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FMA: Pre/Post, n=27



Item	Baseline (Mean)	Follow-up (Mean)
Daily Routine	3.8	5.5
Comfort	3.0	5.5
Health	3.2	5.5
Independent	3.5	5.5
Reach..	3.8	5.5
Transfers	4.5	5.5
Personal Care	4.5	5.5
Indoors	4.2	5.5
Outdoors	3.8	5.5
Transportation	4.5	5.5

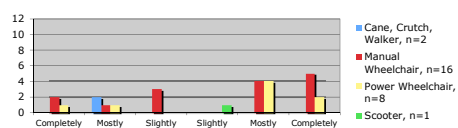
1: completely disagree, 2: mostly disagree, 3: slightly disagree, 4: slightly agree, 5: mostly agree, 6: completely agree

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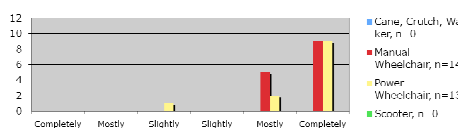
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FMA: Indoors by Device (n=27)

Baseline




Follow-up



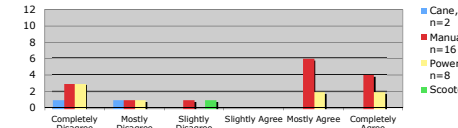
Legend: Cane, Crutch, Walker, n=2; Manual Wheelchair, n=16; Power Wheelchair, n=8; Scooter, n=1

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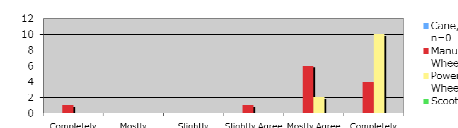
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FMA: Outdoors by Device (n=27)

Baseline



Follow-up



Legend: Cane, Crutch, Walker, n=2; Manual Wheelchair, n=16; Power Wheelchair, n=8; Scooter, n=1

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

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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

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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: _____

2. the **weight** of your assistive device?
Comments: _____

3. the **ease in adjusting** (fixing, fastening) the parts of your assistive device?
Comments: _____

4. how **safe and secure** your assistive device is?
Comments: _____

5. the **durability** (longevity, resistance to wear) of your assistive device?
Comments: _____

6. how **easy** it is to use your assistive device?
Comments: _____

7. how **comfortable** your assistive device is?
Comments: _____

8. how **effective** your assistive device is (the degree to which your device meets your needs)?
Comments: _____

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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

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Warner Medical Center

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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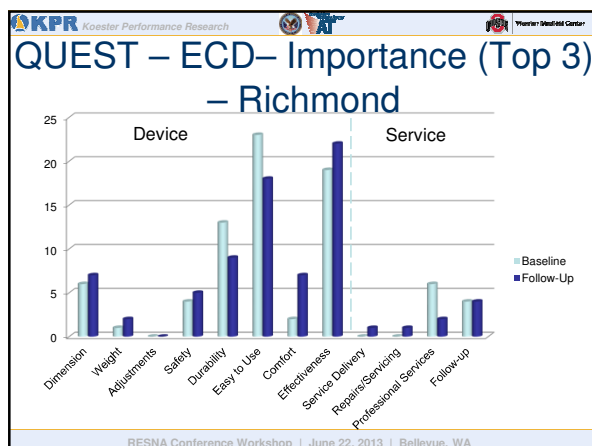
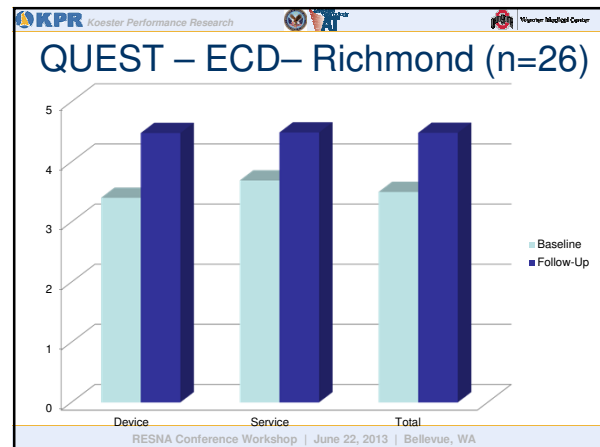
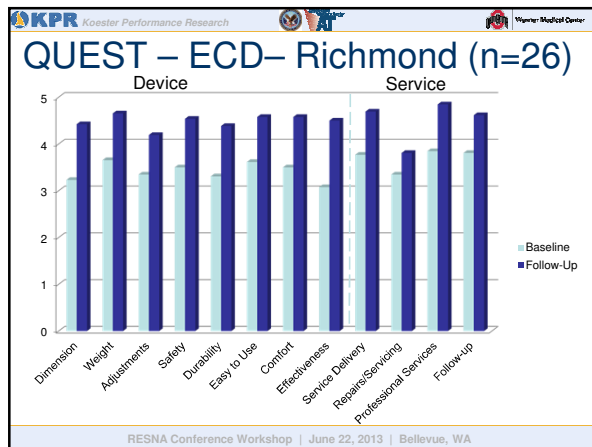
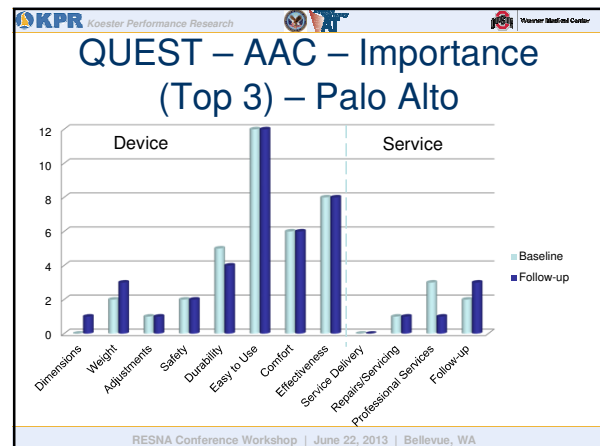
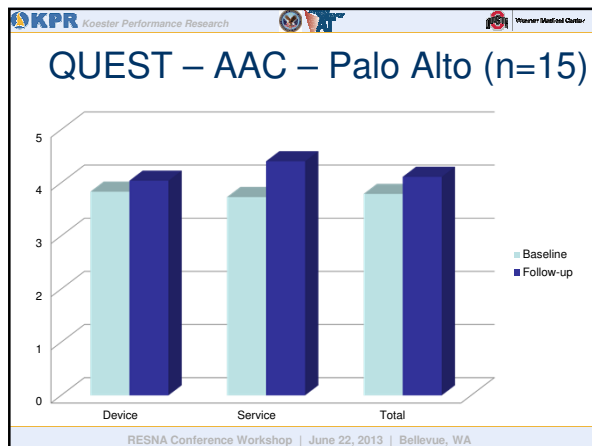
QUEST – AAC – Palo Alto (n=15)

Device

Service

Item	Baseline	Follow-up
Dimensions	4.0	4.5
Weight	3.5	4.0
Adjustments	3.5	3.5
Safety	4.0	4.5
Durability	4.0	4.5
Easy to Use	4.0	4.0
Comfort	4.0	4.0
Effectiveness	4.0	4.0
Service Delivery	4.0	4.5
Repairs/Servicing	3.0	2.5
Professional Services	4.0	4.5
Follow-up	4.0	3.5

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Uses of Outcome Measures

- Quality Assurance
- Program Managers
- Practitioners

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Wexner Medical Center

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

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Treatment – Case Study

- SmartWheel
- Wheelchair Skills Test
- Photos
- Level Belt

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Photos and Level Belt

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Propulsion Analysis with SmartWheel

Training and Feedback decreases frequency and decreases force

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WST

- Mobility only
- Requires that you have a wheelchair
- 32 Items – 2 forms (MWC, PWC)
 - MWC
 - Rolls forward 10 m
 - Rolls 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.

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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

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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

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Questions?

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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

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Final Words

- KPR research & development is supported by:
 - National Institutes of Health
 - Paralyzed Veterans of America Research Foundation
- Thanks for being here today!
- Heidi Koester, hhk@kpronline.com
- Carmen DiGiovine, carmen.digiovine@osumc.edu
- Bill Wenninger, bill.wenninger@va.gov

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