KPR Koester Performance Research

Be an AT Quant!

(Fun and Excellence through the Use of Data)

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Overview – Be an AT Quant!

- Brief introduction
- Use of evidence in computer access and AAC
- All-purpose outcome measurement tools

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A (brief) tale of quants and heuristics

- "quants" -- people with skills in quantitative measurement and analysis
- "heuristic" – experience-based method of decision-making. E.g., using rules of thumb, educated guess, common sense, etc.
- AT, like political strategy, baseball, and other fields, includes this combination of art and science, opinion and facts, intuition and evidence.

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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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The "Pain" of Outcome Measures

- Perception that outcome measures are:
  - Developed by Academics and Researchers
  - Enforced by Management
  - Endured by Clinicians

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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
  - www.kpronline.com/files/externevidresna2006.pdf
- 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

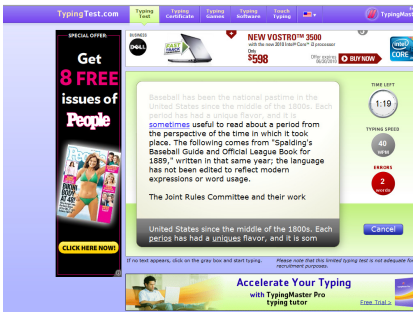
- List of tools:
  - "Standard" typing tests
  - TextTest and StreamAnalyzer
  - Compass software
  - Keyboard Wizard

Free Typing Tests

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

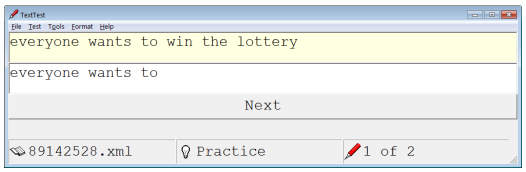
- Typical limitations:
  - Distracting screen
  - One size fits all
  - Can't save results
  - Psychometric validity unknown

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
```

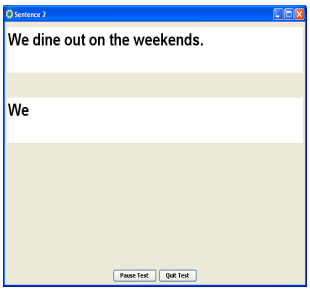
- Trial number
- Test or practice
- Total time for trial
- WPM
- WPM adjusted with errors
- Characters per second
- Keystrokes per second
- Gestures per character
- Average time per character
- Average time between characters
- Plus 24 more

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



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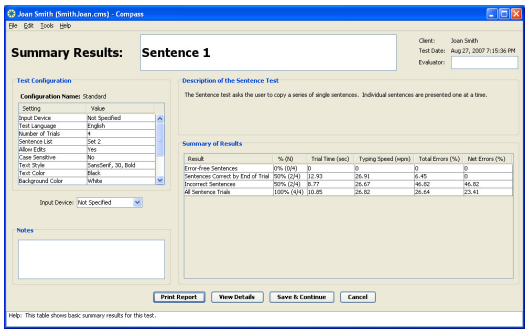
Compass Sentence Report



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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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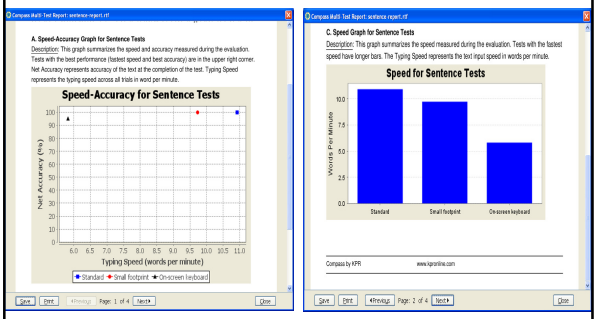
Compass Comparison Report



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Keyboard Wizard

- To establish Sticky Keys and repeat settings

1. Type a sentence

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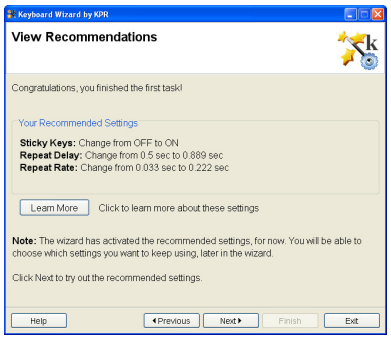
2. Get recommendations, based on how you typed.



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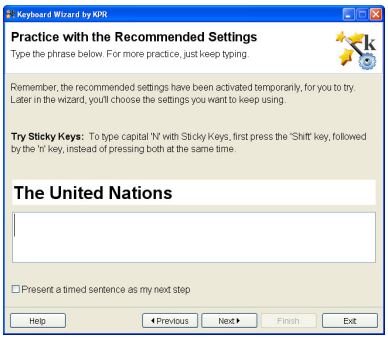
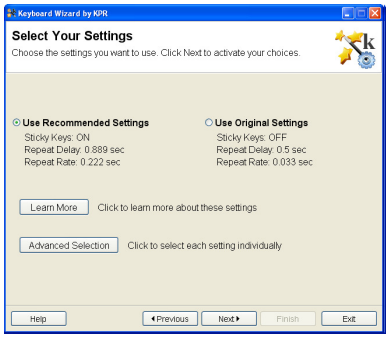
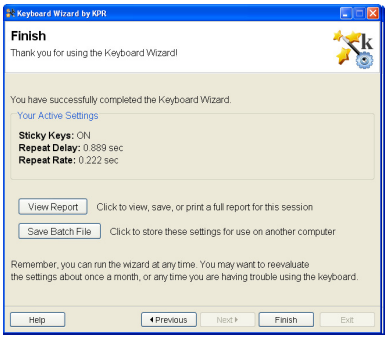
3. Try out the new settings



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)

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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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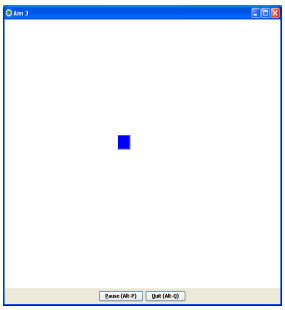
Compass Aim Test

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



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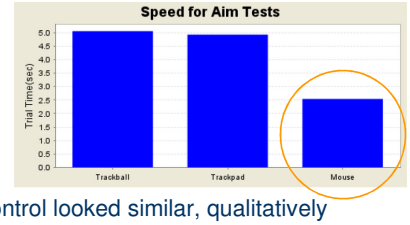
Compass Example: Results



- 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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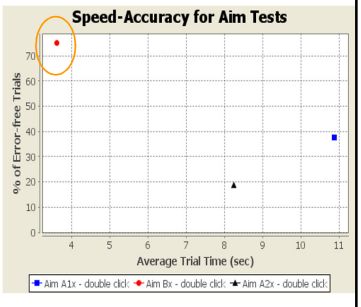
Pointing Wizard Example

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



Data for Switch Use

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

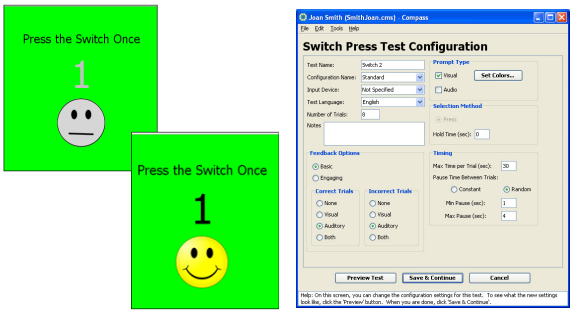
Skills & Measures for Switch Use

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

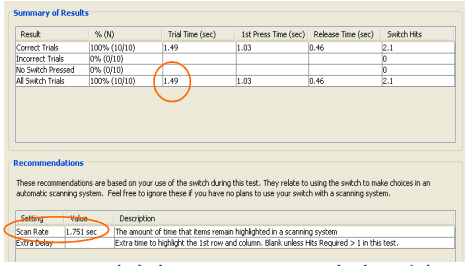
Single Switch Performance Test

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

Compass Switch Press Test



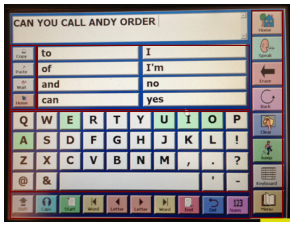
Compass Switch Report



- 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



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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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General Purpose Measurement Tools

- Quebec User Evaluation of Satisfaction with assistive Technology (QUEST)
- Psychosocial Impact of Assistive Devices (PIADS)

QUEST - Demers et al. (1996)
PIADS – Day et al. (2002)

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QUEST

- All types of 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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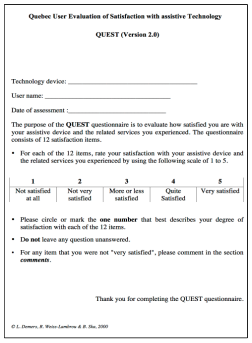
QUEST



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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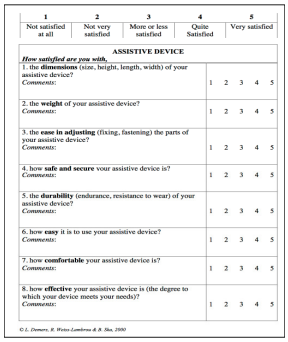

1	2	3	4	5
Not satisfied at all	Not very satisfied	More or less satisfied	Quite Satisfied	Very satisfied

ASSISTIVE DEVICE

How satisfied are you with,

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

- All types of assistive technology
- Requires that you already have a device
- 26 items
  - 12 Competence
    - Independence, Productivity, Expertise, etc.
  - 6 Adaptability
    - Ability to participate, Eagerness to try new things, etc.
  - 8 Self-Esteem
    - Happiness, Security, Sense of power, etc.

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PIADS

- Rate each item from -3 to +3
- -3 for maximum negative impact
- +3 for maximum positive impact

- Summary score reflects overall impact of the device on the individual's life.

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PIADS

Psychosocial Impact of Assistive Devices Scale (PIADS) Today's Date: _____ month/day/year

Client Name:_____ (last name, then first name) ☐ male ☐ female

Diagnosis:_____ Date of Birth:_____ month/day/year

The form is being filled out at (choose one) 1. ☐ home 2. ☐ a clinic 3. ☐ other (describe):_____

The form is being filled out by (choose one) 1. ☐ the client, without any help 2. ☐ the client, with help from the caregiver (e.g., client showed or told caregiver what answers to give) 3. ☐ the caregiver on behalf of the client, without any direction from the client 4. ☐ other (describe): _____

Each word or phrase below describes how using an assistive device may affect a user. Some might seem unusual but it is important that you answer every one of the 26 items. So, for each word or phrase, put an "X" in the appropriate box to show how you are affected by using the _____ (device name).

	Decreases	-3	-2	-1	0	1	2	3	Increases
1)	competence	☐	☐	☐	☐	☐	☐	☐	
2)	happiness	☐	☐	☐	☐	☐	☐	☐	
3)	independence	☐	☐	☐	☐	☐	☐	☐	
4)	adequacy	☐	☐	☐	☐	☐	☐	☐	
5)	confusion	☐	☐	☐	☐	☐	☐	☐	
6)	efficiency	☐	☐	☐	☐	☐	☐	☐	
7)	self-esteem	☐	☐	☐	☐	☐	☐	☐	
8)	productivity	☐	☐	☐	☐	☐	☐	☐	
9)	security	☐	☐	☐	☐	☐	☐	☐	
10)	frustration	☐	☐	☐	☐	☐	☐	☐	
11)	usefulness	☐	☐	☐	☐	☐	☐	☐	
12)	self-confidence	☐	☐	☐	☐	☐	☐	☐	
13)	expertise	☐	☐	☐	☐	☐	☐	☐	
14)	skillfulness	☐	☐	☐	☐	☐	☐	☐	
15)	well-being	☐	☐	☐	☐	☐	☐	☐	
16)	capability	☐	☐	☐	☐	☐	☐	☐	

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Uses of Outcome Measures for Individual Cases

- Pre-intervention
  - Understand how well current AT is/isn't meeting needs
  - Identify features most important to user
- Post-intervention
  - How well new device is meeting needs
  - How well services met needs (QUEST)
  - Specify ideas for improvement

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Uses of Outcome Measures for Programs

- Quality Assurance
  - How well are recommended devices meeting clients' needs
  - How well are services meeting needs (QUEST)
  - Specify ideas for improvement
- Impact
  - What's our program's impact, overall?
  - Are there some AT areas where we have more impact than others?

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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
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- Thanks for your interest!
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