



# Development and validation of an electronic version of the Health Assessment Questionnaire Disability Index (HAQ-DI)

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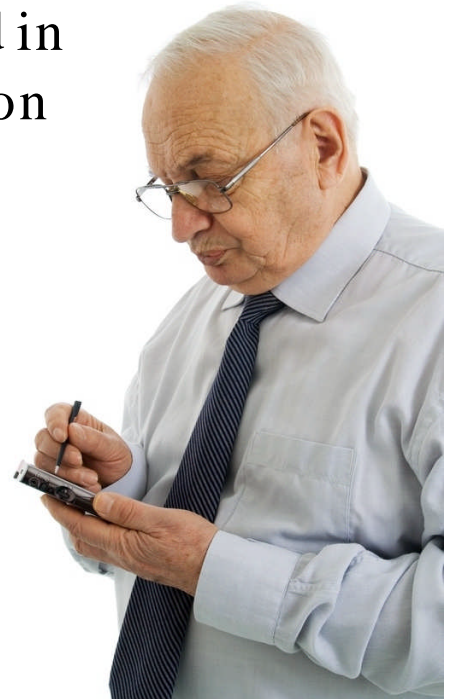
November 10th 2008

# Why use ePRO?

- Only valid, in-range entries can be made
- Time management of entries
- Missing data can be reduced or eliminated
- Data available for prompt review.
- Reminders and feedback enhance compliance
- ePRO easy to use and generally preferred to paper
  - Including the elderly, and those without computer experience or skills

# Migration to Electronic Format

- Where instrument is validated in paper format, electronic version should be equivalent to paper
- Changes in layout of questionnaire may be needed
- Could the changes made affect responses?



# Changes in Migration

<b>Level</b>	<b>Type of change</b>	<b>Action</b>
Minor	No change in context or meaning	Cognitive debriefing
	Justified by existing literature	
Moderate	Changes in layout or wording that could affect interpretation	Equivalence testing
Substantial	Changes that clearly affect context or meaning	Psychometric Validation

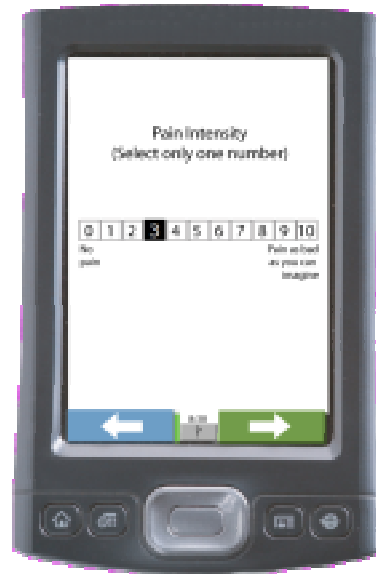
Based on Shields et al. (2006) and Coons et al. (2008)

# Examples of Minor Changes

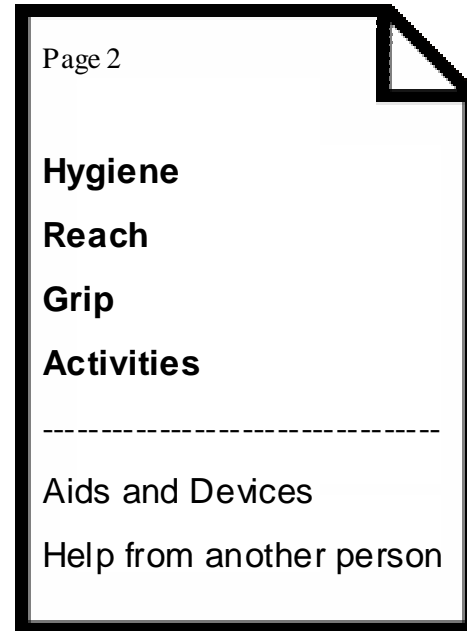
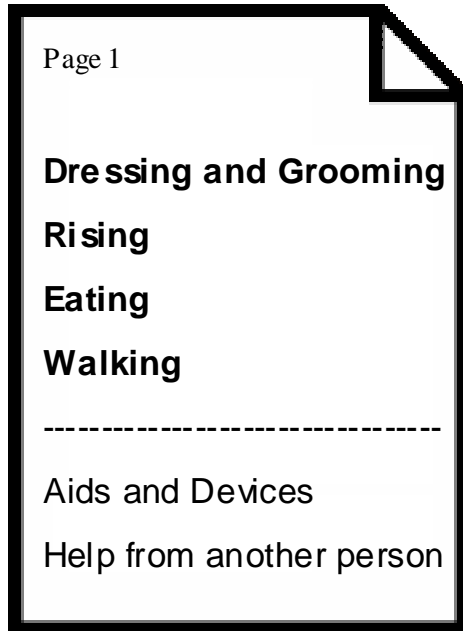
- Tap on a screen
- Press a button

**Rather than tick or circle  
a response on paper**

- Change in length of  
visual analogue scale



# HAQ-DI Domains



# HAQ-DI Question Layout

Please tick the response which best describes your usual abilities **OVER THE PAST WEEK**:

	Without ANY <u>Difficulty</u>	With SOME <u>Difficulty</u>	With MUCH <u>Difficulty</u>	UNABLE <u>To Do</u>
<b>GRIP</b>				
Are you able to:				
- Open car doors?	_____	_____	_____	_____
- Open jars which have been previously opened?	_____	_____	_____	_____
- Turn taps on and off?	_____	_____	_____	_____
<b>Scoring</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>

# HAQ-DI Question Layout

**Please tick any of the following AIDS OR EQUIPMENT that you usually use for any of the activities mentioned above:**

Raised toilet seat

Bath rail

Bath seat

Long-handled appliances for reaching things

Jar opener (for jars  
previously opened)

Long-handled appliances in bathroom (e.g.: a long  
handled  
brush)

Other (Please specify: \_\_\_\_\_)

**Please tick any of the following categories for which you usually need HELP FROM ANOTHER PERSON:**

Hygiene

Gripping and opening things

Reaching

Shopping and housework



# HAQ-DI Scoring

- Each domain is scored with a combination of DIFFICULTY and whether AIDS or HELP are used for activities in that domain
- Information about specific devices used (including free text in “other”) are used only to allocate score to domain
- Final score is mean of eight domain scores from 0 (no disability) to 3

# HAQ-DI: Electronic

**GRIP  
OVER THE PAST WEEK:**

Are you able to: open car doors, open jars (that have been previously opened), and turn taps on and off?

← ? →

**GRIP  
OVER THE PAST WEEK:**

Do you use any AIDS OR EQUIPMENT for GRIP, for example, a jar opener (for jars previously opened)?

← ? →

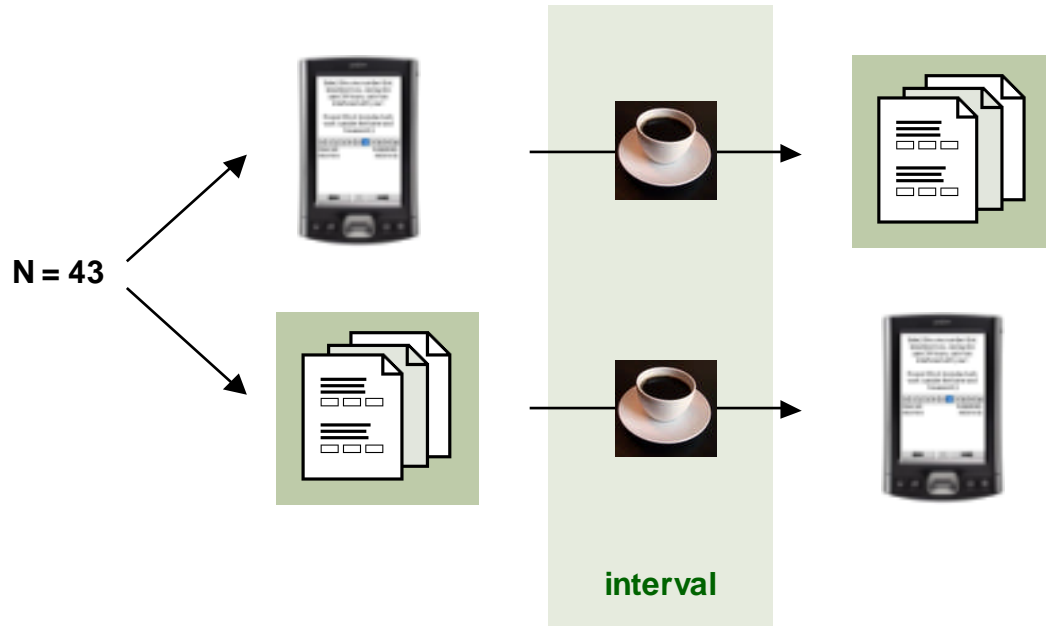
**GRIP  
OVER THE PAST WEEK:**

Do you usually need HELP FROM ANOTHER PERSON with gripping and opening things?

← ? →

- Each domain is self contained
- No free-text entry
- Scoring algorithm is unchanged from original

# Equivalence Study Design



# Quantifying Equivalence

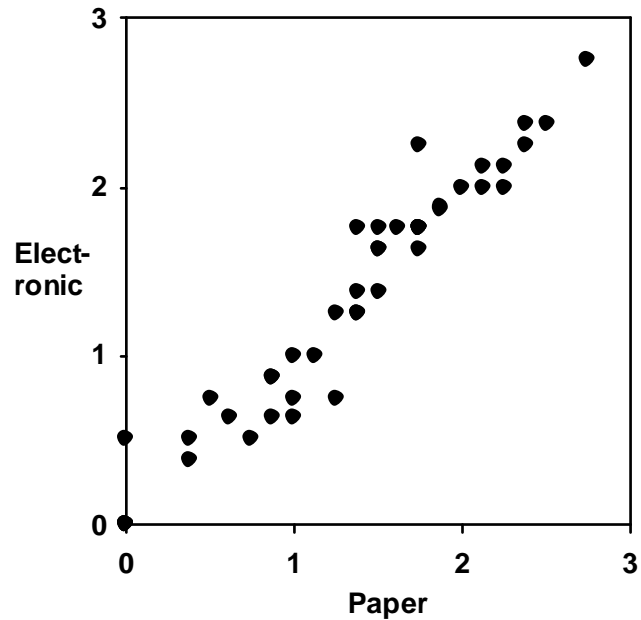
- Correlational approach
  - Intraclass correlation coefficient (ICC) is preferred to Spearman's  $r$ .
  - Value from 0 (no agreement) to 1 (perfect agreement)
- Numerical agreement approach
  - Based on precision of measurement
  - Agreement indicated by size and variance of Electronic-Paper differences in scale measure.

# Intraclass Correlation

**ICC = 0.96:**

**Excellent  
agreement**

Case (2,1) from Shrout and Fleiss (1979) is used. This is also referred to as the absolute agreement form of the ICC (Friedman 2005)



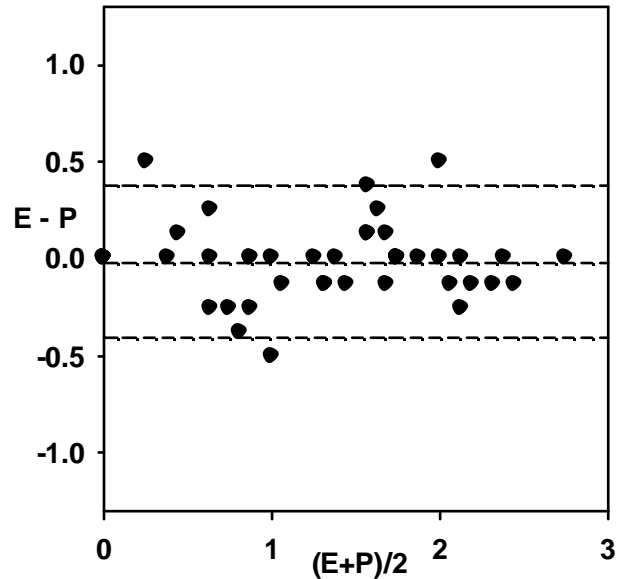
# ICC and Range

- Correlation-based measures such as ICC are very dependent on range of values in sample
- ICC will increase if variability is high
  - Wide range of severity in sample
- ICC will be lower if variability is restricted
  - Normal population vs clinical group
  - Inclusion criteria specifying minimum severity

**Other measures should be used as well as ICC**

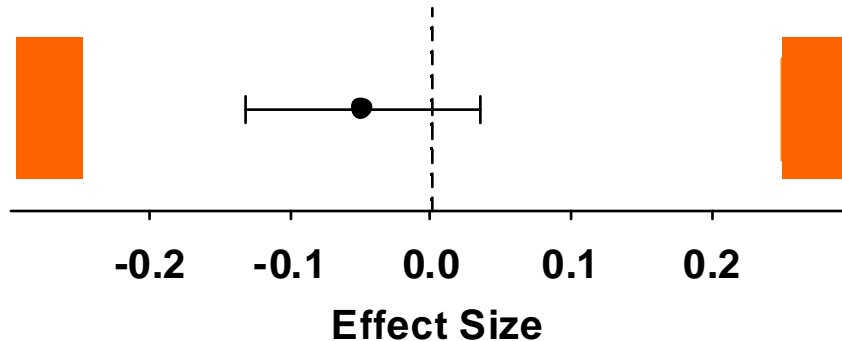
# Bland-Altman Plot

- Distribution as expected
- No serious outliers
- No tendency for bias



# Bioequivalence Model

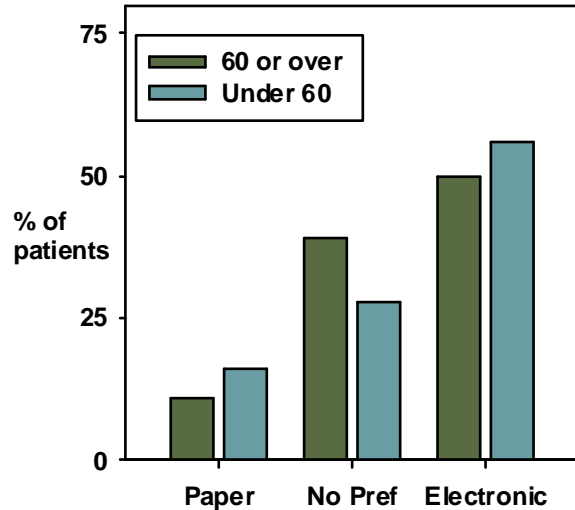
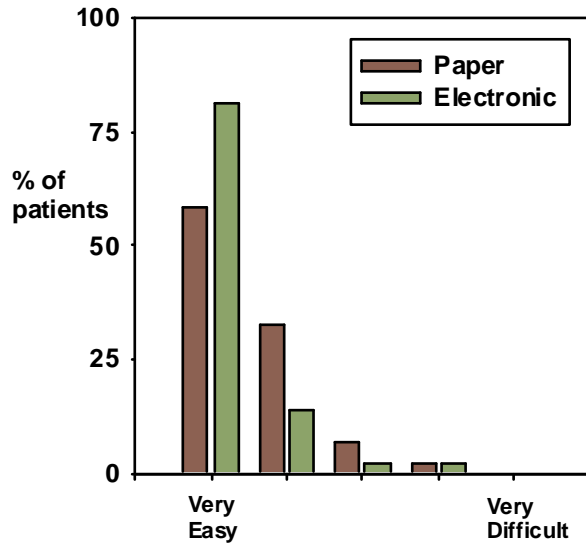
Target window  $\pm 0.25$  ES



- Mean E-P difference is small:  $\sim 1\%$  of scale length
- Confidence intervals are well within target window



# Patient Acceptability



# Conclusions

- HAQ-DI shows excellent agreement between paper and electronic versions, showing that migration has not affected scale scoring
- Electronic version very acceptable to patients