STRENGTHS, LIMITATIONS, AND POTENTIAL APPLICATIONS OF THE WORK DISABILITY FUNCTIONAL ASSESSMENT BATTERY

Workshop of the 2018 EUMASS Congress
A comprehensive and efficient functional assessment instrument: The Work Disability Functional Assessment Battery (WD-FAB)

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Acknowledgement

This research was funded through an Inter-Agency Agreement with the U.S. Social Security Administration and by the Intramural Research Program of the NIH, Clinical Research Center.
US Social Security Administration (SSA)

Disability Programs:
- Serves 19 million adults and children
- $187 billion annually
- Benefits:
  - Cash ($700-1700/month)
  - Health insurance
- “All or nothing”

Escalating pressure:
- High volume of new cases
  - 2-3 million applicants/year
- Over 22000 employees projected to retire by 2020
- Largest backlog in US government
  - Applicants wait months to years for decision
Work Disability Functional Assessment Battery

- Self-reported assessment of functional ability as relates to work
- Uses modern test theory for efficient, individualized assessment
- 300+ questions in 8 scales of Physical Function and Mental Health
Framework

To assess work (dis)ability need to know:
• What a person can do
• Demands of work environment

WD-FAB uses ICF Activity domain to assess what a person can do
Item Response Theory (IRT):
- Model the likelihood of a “correct” answer given a person’s ability level
- Questions calibrated to a scale that covers range of function in one dimension (e.g., mobility)
- Provides platform for efficient administration using computer adaptive testing (CAT)

Computer Adaptive Testing (CAT):
- Administer small number of questions from the IRT calibrated ‘item bank’
- Choose questions based on previous responses
- Apply stopping rules:
  - Score reaches desired precision, or
  - a set number of items are answered

IRT and CAT methods create a tailored, individualized assessment that best measures the ‘ability’ of that person
IRT Example: Physical Function

- Are you able to walk a block on flat ground?
- Are you able to run or jog for two miles?
- Are you able to run five miles?
CAT Example with Physical Function

-2.50 - getting into a squatting position
-1.50 - making sharp turns
-1.20 - getting into a keeling position
-0.52 - walking 100 yards
-0.05 - walking around blocks
0.49 - walking briskly
1.20 - getting into a keeling position
1.50 - running 5 miles
1.74 - running 5 miles
1.47 - making sharp turns
1.00 - being in a squatting position
0.50 - walking briskly
0.49 - walking briskly
0.00 - being in a squatting position
-0.25 - sitting on a bench for 1 minute
-0.52 - walking 100 yards
-0.05 - walking around blocks
-1.06 - getting in & out of a car
-1.55 - standing at a sink
-1.95 - walking inside your home
-2.12 - sitting down in an armless bench
-2.45 - sitting on a bench for 1 minute
-2.58 - turning over in bed
-2.88 - sitting on a bench for 1 minute
-3.00 - sitting on a bench for 1 minute

-3.00 - sitting on a bench for 1 minute
-2.50 - getting into a squatting position
-1.50 - making sharp turns
-1.20 - getting into a keeling position
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WD-FAB Domain Structure

Physical Function Domain
- Basic Mobility
- Upper Body Function
- Fine Motor Function
- Community Mobility
  - Driving
  - Public Transportation
- Wheelchair

Mental Health Domain
- Communication & Cognition
- Resilience & Sociability
- Self-Regulation
- Mood & Emotions
WD-FAB Functional Profiles

WD-FAB Scores for John Doe

The display below compares the most recent assessment to the working age adult mean (50). To compare with previous assessment(s), click on the desired date(s).

- Mean
- 11/15/2017
- 2/15/2018
- 5/15/2018
WD-FAB Technical Strengths

- Low respondent burden
  - Selects questions most relevant to the respondent

- Efficient
  - <2 min/scale, 15-20 minutes total
  - Using IRT/CAT - comprehensively assesses functional activity

- User friendly
  - Multiple administration modes (in-person, phone, web-based)

- Item pools are not static and may be replenished and improved

- Instrument precision may be adjusted
WD-FAB Applied Strengths

- Standardized and consistent assessment of function
- Can track functional changes over time
- IRT/CAT instruments have been successfully translated into other languages
WD-FAB Limitation

- WD-FAB outcomes must be linked to workplace demand
  - WD-FAB measures at the activity level
  - Must link whole person functioning to work
    - No known gold standard
    - A challenge confronted by all social security programs
    - Potential approach:
      - Use WD-FAB to develop functional profiles by occupation
Potential Applications of the WD-FAB

- **Research:**
  - Monitor function over time as an indicator of population health
  - Track influence of intervention strategies on functioning

- **Applicant support:**
  - Who needs help? Identify functional profile thresholds for program constituency
  - What job fits best? Examine functional profiles relative to occupational demand to allow assessment of “fit”
WD-FAB Access

- Current web version of WD-FAB in beta testing
  [https://www.wdfab.net/portal](https://www.wdfab.net/portal)

- Global users will be able to access through Amazon Web Services (Frankfurt, Ireland, London, Paris)

  OR

- Can host local version using own hardware
Thank you!
Questions?
Moving from conceptualization to measurement of whole person functioning in the WD-FAB

Julia Porcino
The Work Disability Functional Assessment Battery

Work Disability:
- Misalignment between what a person can do and the demands of work

The Work Disability Functional Assessment Battery (WD-FAB)
- Self-reported measure of functional activity
- Measures whole person function
- Focuses on activities that relate to work
Framework

Use ICF Activity domain to assess what a person can do

Comprehensive assessment of function using Item Response Theory
  - Item Banks
Item Bank Development

- Extensive literature review
- Focus groups with providers & individuals with disability
- Met with content experts
- Cognitive Testing of all items to check clarity & comprehension
- Items administered to user groups
Initial Item Pools

Physical Function:
174 Initial Items
- 75 new items
- 31 PROMIS/NeuroQOL
- 22 other instruments

139 final items for calibration

Mental Health Function:
361 Initial Items
- 273 new items
- 57 PROMIS/NeuroQOL
- 31 other instruments

165 final items for calibration
Hypothesized Domain Structure

- **Learning & Applying Knowledge**
  - Purposeful sensory experiences, Basic learning, Applying knowledge

- **General Tasks & Demands**
  - Understanding a single task,
  - Understanding multiple tasks, Carrying out daily routine, Handling stress and other psychological demands

- **Communication**
  - Receiving messages, producing messages, Use of communication devices

- **Activities Relevant to Work-Disability**

  - **Mobility**
    - Changing and maintaining body position, Carrying, moving and handling objects, Walking and moving, Moving around using transportation

  - **Self-Care**
    - Washing oneself, Caring for body parts, Toileting, Dressing, Eating, Drinking, Looking after one’s health

  - **Interpersonal Interactions & Relationships**
    - General interpersonal interactions, Particular interpersonal relationships
Linking Items

Link to ICF:
- Items linked to ICF chapter and category
  - 3 digit ICF codes
  - 8 ICF Activity chapters + 1 Body Functions chapter

WD-FAB:
- Items calibrated to WD-FAB scales
- Factor Analysis
## Comparing ICF and WD-FAB

### WD-FAB Scales (Empirically Derived)

<table>
<thead>
<tr>
<th>ICF Chapters</th>
<th>Total Items</th>
<th>Basic Mobility</th>
<th>Upper Body Function</th>
<th>Fine Motor Function</th>
<th>Community Mobility</th>
<th>Cognition &amp; Communication</th>
<th>Self-Regulation</th>
<th>Resilience &amp; Sociability</th>
<th>Mood &amp; Emotions</th>
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</thead>
<tbody>
<tr>
<td>Learning &amp; Applying Knowledge</td>
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<tr>
<td>Mobility</td>
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<td>54</td>
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<td>42</td>
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<td>Domestic Life</td>
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<td>7</td>
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<td>Interpersonal Interactions &amp; Relationships</td>
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<tr>
<td>Community, Social &amp; Civic Life</td>
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<tr>
<td>Mental Functions*</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Mental Functions ICF chapter is not included in Activity & Participation Domain*
Comparing ICF and WD-FAB

<table>
<thead>
<tr>
<th>WHO-ICF Organization</th>
<th>WD-FAB Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning &amp; Applying Knowledge 19</td>
<td>Communication &amp; Cognition 66</td>
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<tr>
<td>General Tasks &amp; Demands 25</td>
<td>Mood &amp; Emotions 34</td>
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<td>Communication 23</td>
<td>Self-Regulation 34</td>
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<td>Mental Functions 71</td>
<td>Resilience/Sociability 29</td>
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<tr>
<td>Interpersonal Interactions &amp; Relationships 26</td>
<td>Basic Mobility 56</td>
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<tr>
<td>Mobility 130</td>
<td>Upper Body Function 34</td>
</tr>
<tr>
<td></td>
<td>Fine Motor Function 45</td>
</tr>
</tbody>
</table>
Items not Included

- Items from key area of Social Appropriateness (Grooming) not included
  - I often feel over or under dressed.
  - People have told me I need to dress better.
  - I have trouble taking a shower or bath often enough.*
  - People have told me I need to take a shower or bath more often.*

- *Items factored but response highly dichotomous
  - >70% disagree or strongly disagree
Conclusion

- Empirical measurement of function does not align with the conceptualization represented by the ICF
  - 1 ICF chapter can contribute to several WD-FAB scales
  - 1 WD-FAB scale can measure constructs from multiple ICF chapters

- Content that researchers and experts viewed as important could not be included in the WD-FAB
  - Potential limitation related to self-report
Thank you!
Questions?
Evidence of Validity and Future Directions for Implementation of the WD-FAB: Physical Function Scales

Christine McDonough
WD-FAB Physical Function Scales

Physical Function

- Basic Mobility
  - Wheelchair Mobility
- Upper Body Function
- Fine Motor Function
- Community Mobility
  - Public Transportation
  - Driving
Psychometric Studies:

Initial studies:

- Test-Retest Reliability
- Validity relative to Legacy Comparator Measures
- 1. Score Interpretability: Functional Levels/Stages
- 2. Score Distributions, Ceiling/Floor for Expanded WD-FAB
- 3. Initial validity test of Functional levels
Initial Psychometric Studies

- Test-Retest Reliability (Marino 2015)
  - n = 316 adults reporting work disability (physical conditions)
  - WD-FAB test-retest 7-10 days
  - ICC\(_{3,1}\) Basic Mobility: \( r = 0.86 \); Upper Body Function: \( r = 0.84 \); Fine Motor Function: \( r = 0.76 \); Driving: 0.66; Public Transportation: \( r = 0.75 \); Wheelchair: \( r = 0.73 \)
Initial Psychometric Studies

Validity: Correlation with Legacy measures (Meterko 2015)

- n= 476 US adults with self-reported work disability
- PROMIS PF: Basic Mobility: $r = 0.82$; Upper Body Function: $r = 0.75$; Fine Motor Function: $r = 0.60$; Driving: 0.25; Public Transportation: $r = 0.57$
- PM-PAC Mobility: Basic Mobility: $r = 0.53$; Upper Body Function: $r = 0.55$; Fine Motor Function: $r = 0.34$; Driving: 0.29; Public Transportation: $r = 0.48$
1. Score Interpretability: Thresholds for Functional Levels
1. Score Interpretability: Thresholds for Functional Levels

- **Design:**
  - Cross-sectional, secondary data from 3 independent samples

- **Subjects:**
  - 999 from general working age adult sample
  - 1,017 disability applicants
  - 497 work-disabled internet panel participants

- **Methods:**
  - item mapping
  - 8 experts in work disability from a range of disciplines
  - modified-Delphi for consensus -3 steps
  - known-groups validation analysis
1. Score Interpretability: Thresholds for Functional Levels

- Heavy/Protracted/Overhead
- Larger Loads & Lifts
- Basic Lift/Pull/Carry

5 Functional Levels

- Lowest
- Low
- Mid
- High
- Highest

4 Cut Scores: -2.9, -1.6, -0.9, 0.5
Upper Body Function involves using arms and body to push, pull and carry objects and move them from one place to another.

<table>
<thead>
<tr>
<th>Functional Level</th>
<th>Score Range</th>
<th>Description</th>
</tr>
</thead>
</table>
| Very Low         | 0-16        | **Persistent, significant limitations** in moving objects around in everyday life. For example:  
  - *unable* to do easy activities such as opening a drawer or making a bed  
  - *unable to do* a wide range of harder activities such as moving furniture to clean, unloading a dishwasher and doing yard work for an extended period of time. |
| Low              | 17-26       | **Periodic, significant limitations** in moving objects around in everyday life. For example:  
  - has *a lot of difficulty* performing the easiest activities such as opening a drawer or making a bed  
  - *unable* to do more difficult activities such as cleaning out a closet and carrying a full trash bag outside |
Results. Example: Upper Body Function
2. Expanded WD-FAB Score Distribution: Methods

- Methods:
  - We compared claimant and general working age score distributions
    - Hypothesis: claimant scores would be lower than the working age adult
  - We evaluated floor and ceiling effects by calculating the proportion of the sample with the lowest and the highest possible score respectively.
2. Expanded WD-FAB Score Distribution. Results

Basic Mobility

![Histogram showing sample and normative score distributions for Basic Mobility](image-url)
### Percent at Ceiling & Floor by Scale for 5-10 item CAT, n=1024 Claimants

<table>
<thead>
<tr>
<th>Scale</th>
<th>Floor (%)</th>
<th>Ceiling (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Mobility</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Upper Body Function</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Fine Motor Function</td>
<td>0.0</td>
<td>2.6</td>
</tr>
</tbody>
</table>
Cross sectional: 1,000 claimants and 1,000 from general working age adult sample

Methods: For general sample we collected highest exertion level that could be performed as their fulltime job via self-report. We examined the relationship between WD-FAB physical functional level and self-reported physical exertion ability level.

1. unable
2. light
3. medium
4. medium
5. heavy
6. very heavy
Study 3. Validity: Methods

- Explored the distribution of functional levels in claimant and general sample
- Conducted correlation analysis Functional Level (1-5) and Self-reported physical work ability level (1-6) (general sample n=1000)
Summary of Findings & Next Steps

- Analyses across samples support validity of WD-FAB in measuring physical functioning relative to work disability.
- Need experience with application in disability services settings to assess added value.
Future Directions for Implementation

- Language or cultural translation requirements
- Consider goals of measurement:
  - Describing functioning at one point in time
  - Measuring change over time
- Assess workflow for target setting
  - When would scores be most useful
  - How would the WD-FAB be administered
- Elicit feedback on
  - Value of functional profiles in assessment process
  - Score reports and WD-FAB training program
Thank you!
Questions?