Cyber Aptitude and Talent Assessment

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Aptitude

“The science of:

**Measuring** stable mental capacities, skills, personality traits, beliefs, and knowledge

**Discovering** relations

**Making** predictions based on those relations.”

# Approach to Measuring Cyber Aptitude

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<td>Define cyber</td>
<td>Determine cognitive abilities, dispositions &amp; skills that matter for cyber</td>
<td>Test those abilities</td>
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Cyber Aptitude Measurement - Challenges

Diverse set of jobs and work roles
◦ Enumerated in the National Initiative for Cyber Education (NICE) framework
◦ No single set of characteristics covers all “cyber” jobs

Subject-matter knowledge required changes rapidly
Some common tasks across lots of jobs aren’t diagnostic
Cyber Aptitude Measurement - Solutions

Some tasks are characteristic of a particular job

Cognitive task analysis of tasks required for specific jobs
- Break them down into tasks
- Figure out how those tasks fit a common framework
- Document cognitive requirements

Goal: Determine which tasks make a job “hard”
Reconcile with current general tests (e.g., ASVAB)
Cyber Job Model

Quadrants = major tasks with characteristics described on axes

Example:
“Defending” → response to problem in real-time
“Development” → initiation of exhaustive solution
Proposed measures

Initiate: mental models, creative thinking
Respond: anomaly detection, vigilance
Real-time: perceptual speed, proceduralization, resistance to interference
Exhaustive: delay closure, weigh risk and reward
Step 1: Describe individual tasks
Step 2: Map tasks onto job descriptions
Step 3: Create an aptitude profile for job
Validation: multiple strands

Validate critical thinking measures
- With college students, military recruits, entry-level employees
- Populations will not be identical in background, may not be directly comparable

Validate job models relative to documentation and ethnographic data

Validate job-specific measures with specific jobs
How is Aptitude Information Useful?

A practical and theoretical aptitude battery – based on a systems model – can diagnose strengths and weaknesses

- Cognition
- Disposition
- Motivation & Persistence

Useful for:
- Selection and placement decisions (like any psychometric test)
- (Unlike ordinary correlational tests) make aptitude-by-treatment (ATI) decisions
  - Identify people needing training or other interventions for success
  - Identify people who will benefit from tailored instruction
  - Informs training
Next steps

Cognitive task analyses of high-value cyber work roles
Determining what attributes predict success in cyber training
Creating profiles to aid in selection for particular jobs
For more information

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NICE Framework Categories

Securely provision: IA compliance, system requirements planning
Operate and maintain: data admin, network services
Protect and defend: CND analysis, incident response
Investigate: digital forensics, investigation
Collect and operate: collection operations, cyber operations, cyber operations planning
Analyze threat: analysis, exploitation analysis, all-source intelligence
Oversight and development: Legal advice, education, ISSO, CISO
Systems Model: Abilities, Beliefs, Traits & Circumstances for Cyber

CASL’s research on language aptitude