

U.S. Army Research Institute for the Behavioral and Social Sciences

Army Selection and Training Research Interests

Army Science Conference

2 Dec 08



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Purpose

Provide an overview of ARI's research mission

For Soldier selection and training:

- Describe key Army challenges and research interests
- Highlight ARI research efforts
- Outline challenges for neuroscience research





Some Army S&T Labs & Mission Areas



**Deputy Chief
of Staff, G-1**

**Army Research
Institute (ARI)**

- Personnel
- Training
- Leader development

Research psychologists

- Experimental
- Social
- Cognitive
- Industrial/organizational

**U.S. Army
Medical
Command**

Medical Research and
Materiel Command (MRMC)

**Walter Reed Army
Institute of Research**

- Physical and
psychological health

**Army
Materiel
Command**

Research, Development, and
Engineering Cmd (RDECOM)

**Human Research Engineering
Directorate (HRED), ARL**

- Human-systems design

**Simulation & Training Technology
Center (STTC)**

- Simulation technology

NATICK Soldier System Center

- Food, clothing, shelter,...

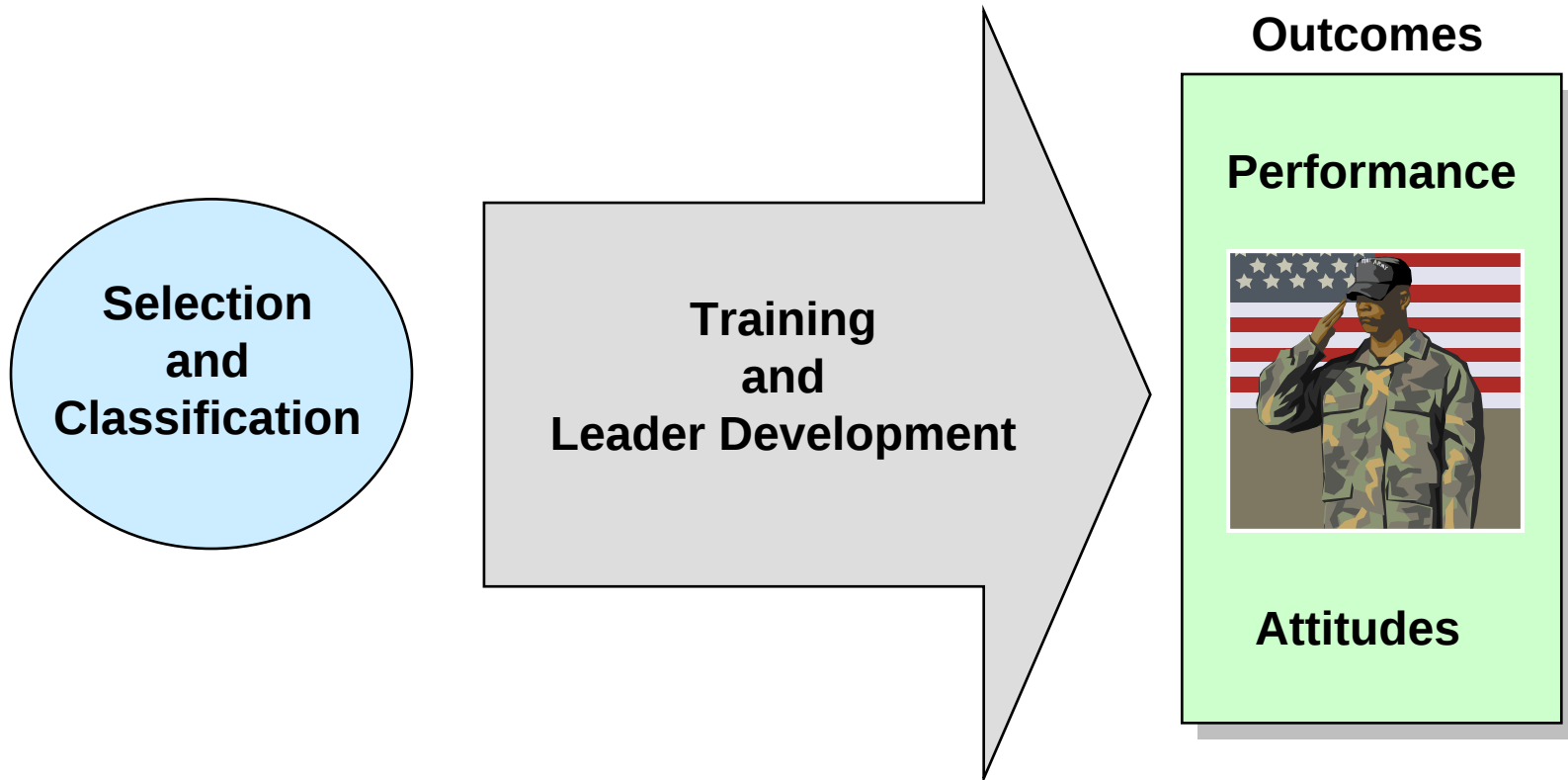
**Communications-Electronics
Research Development Center**

- Communication/info technologies



ARI Overarching Research Goals

- Develop new measures to meet Army personnel goals without reducing quality.
- Develop effective methods to train Soldiers and units, and grow agile leaders.





Trainability Continuum for Characteristics Related to Human Performance



Stable Attributes
(less trainable)

Malleable Attributes
(more trainable)



Abilities & Traits

- Cognitive ability
- Resiliency
- Tolerance for ambiguity
- Achievement motivation
- General self-efficacy
- Other temperament and personality characteristics (e.g., openness, conscientiousness)

Higher Order Skills & Attributes

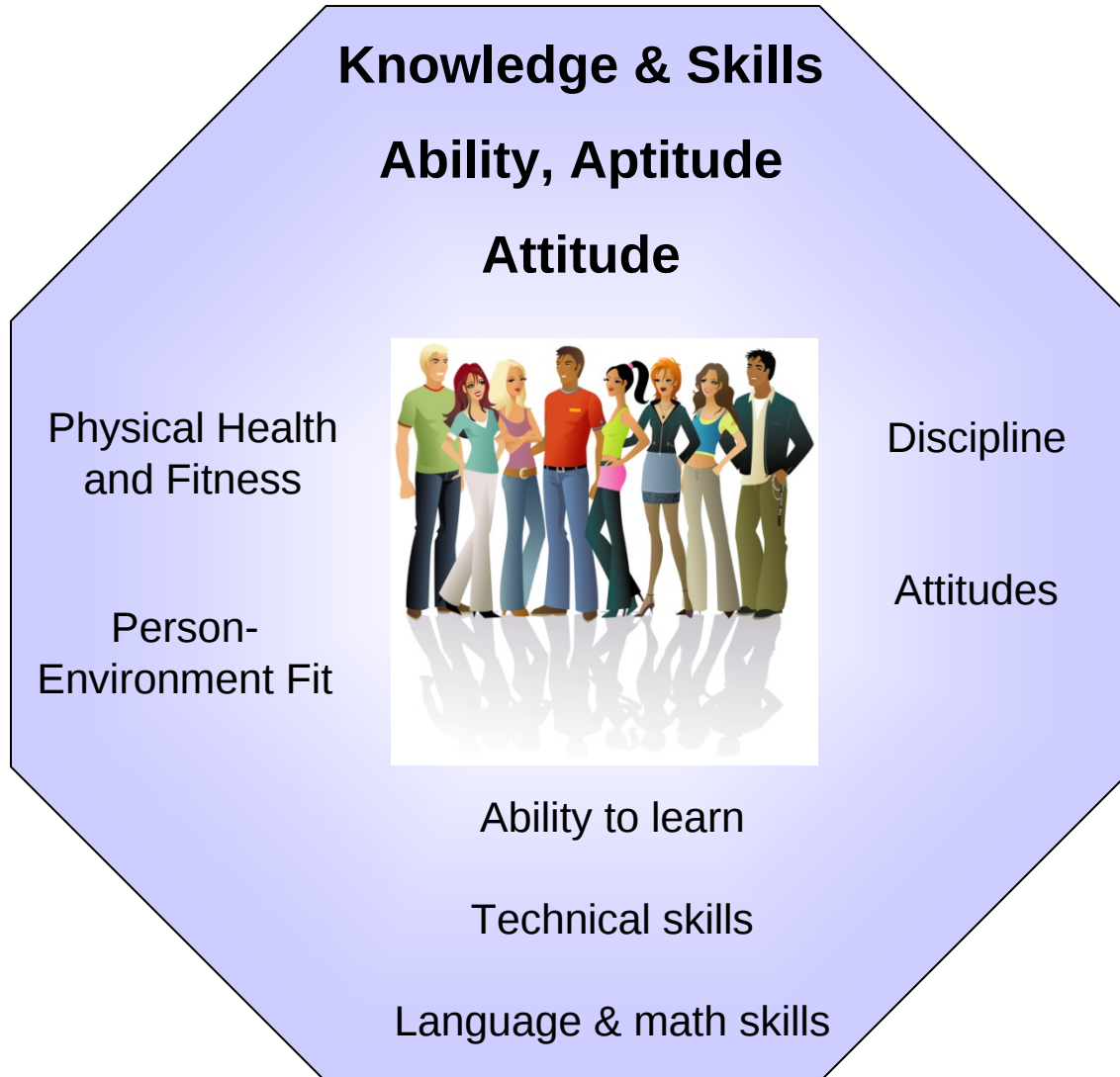
- Problem solving/decision making skills
- Metacognitive skills
- Interpersonal skills
- Communication skills (e.g., negotiation, persuasion, collaboration)
- Awareness (self, others, situation)
- Complex motor and physical skills
- Moral development/ ethical reasoning
- Goal orientation (learning, mastery)

Knowledge

- Domain-specific knowledge
- General knowledge acquired through diverse experiences
- Routine procedures and tasks



Army Enlisted Selection



Current Measures

Physical Fitness and Medical Exams

Credentials and Records

- High School Diploma
- Alternative (e.g., GED)
- Criminal history

Knowledge & Analytical Tests

Armed Forces Qualification Test

- Language and math
- Technical (e.g., mechanical)



Army Selection: Research Areas



Need: Army must meet accessions goals without reducing quality.

Challenges: Decreasing percentage of population meets Army enlistment standards. Declining propensity to enlist. Changing demographics.

Current measures: Predict trainability and attainment of knowledge and skill during training, but do not account for all the variance in job performance. Weak predictors of attitudes, attrition, and career intentions.

Areas of research interest:

- Assessment of cognitive potential (ability to learn, mental flexibility,...)
- Assessment of temperament (motivation, dependability, ...)
- Integrated 'whole person' assessment of cognitive and non-cognitive attributes
- Prediction of best match for an Army career/ specific jobs



ARI Research: Selection Measures

Mental Flexibility

Tests to assess abilities such as:

- Flexible inference
- Flexible mapping of rules

Select the best word to complete the analogy (pretend that the statements are true):

Toothbrushes are made of ice.

tool : toolbox :: toothbrush : ?
freezer garage tool shed bathroom

Prelim findings: Adequate reliability and construct validity with college population (Matthew & Stemler, 2007).

Temperament

Self-report measures assess constructs such as:

- Dependability
- Leadership
- Excitement seeking



Which of these statements is most like you?

- I like roller coasters.
- I enjoy parties.

Findings: Predicts Soldier attrition.

Prelim findings: Predicts Soldier discipline rates and physical fitness. Contributes to prediction of training exam scores.



Neuroscience Challenge



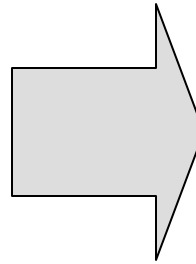
Can measures based on neuroscience improve the assessment of an individual's potential and predict behaviors and attitudes?

Valid

Reliable

Feasible (cost, efficiency, practical)

- above and beyond existing measures



Specific metrics for:

- Knowledge & skills
- Ability
- Aptitude
- Attitude

That predict measurable behaviors and attitudes

- Training and performance scores
- Discipline rates
- Career intention/ progression



Army Training and Leader Development



Knowledge Skills Attitudes



Basic combat
skills

Tactical &
technical
proficiency

Command &
control

Army Values

Leadership and
team skills

Interpersonal skills

Cross-cultural competence

Current Methods

- Instruction
- Demonstration
- Practice with feedback
- Mentoring
- Self-development

Environments

- Live (Classroom, Field)
- Virtual (simulations, computer-based instruction)

Current Measures

- Objective measures
 - time, accuracy
 - behavioral-anchored rating scales
 - mission accomplishment
- Subjective measures
 - Leader/peer ratings
 - Self-assessment/report



Army Training and Leader Development



Need: Army must develop effective training methods for individuals and units. Develop agile leaders.

Challenges: Increasing (and continually evolving) training requirements. Decreasing resources and time for training. Increased responsibility and operational challenges at lower levels of command.

Areas of research interest:

- Basic Combat Training (civilians to Soldiers)
- Unit training and collective measurement
- Developing leader skills (influence, team building, complex organizations)
- Developing cross-cultural competence and language skills
- Rapidly turning lessons learned into training
- Determining skill decay and methods to sustain skills
- Tactical employment of new technologies
- Optimal blend of live, live co-located and distributed training
- Effective design of virtual and game-based simulations



ARI Research: Training & Leader Dev



Flexible Thinking Skills

Leaders develop flexible thinking skills during operational experience.

Research challenge: Create method to capture tacit knowledge of experts. Develop effective training method to accelerate development of flexible battlefield thinking skills.



Research findings: Training method accelerates development of tactical thinking skills of junior officers.

Tailored Training

Extensive empirical evidence to conclude that tailoring training and feedback to the individual accelerates the rate of learning.

Research challenge: Create intelligent agents that can provide individualized tutoring/coaching in synthetic training environments.



Components

- Model of domain/expert
- Model of instructor/coach
- Model of learner



Neuroscience Challenge



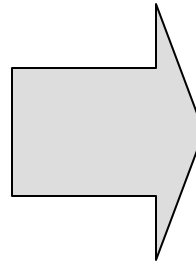
Can neuroscience improve the measures and methods to train Soldiers and develop Leaders?

Valid

Reliable

Feasible (cost, efficiency, practical)

- above and beyond existing measures and methods



Measures and methods to develop:

- Psychomotor Skills
- Knowledge
- Situation Understanding
- Reasoning
- Leadership

That achieve measurable behaviors and attitudes for differing levels of required proficiency.

- Training and performance scores
- Mission outcomes



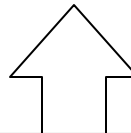
Neuroscience and Behavioral Science



Hypothesis: Experts are more cognitively efficient than novices.

Primary Evidence: Behavioral Science

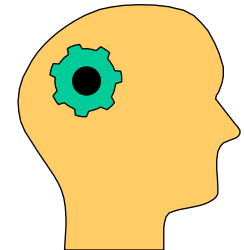
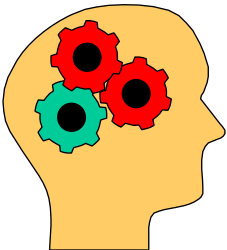
- Primary task performance (time, accuracy, quality)
- Secondary and multi-task performance (quantity, quality)



Expertise is determined by observable performance.

Corroborating evidence: Neuroscience

Fewer neural resources needed.





A Learning Taxonomy

Competence	Skills Demonstrated
Knowledge	Observe and recall information, knowledge of dates, events, places, major ideas, mastery of subject matter
Comprehension	Understand information and meaning, grasp meaning, translate knowledge into new context, interpret facts, compare, contrast, infer causes, predict consequences
Application	Use information, methods, concepts in new situations, solve problems using required skills or knowledge
Analysis	See patterns, organization of parts, recognize hidden meanings, identify components
Synthesis	Use old ideas to create new ones, generalize from given facts, relate knowledge from several areas, predict, draw conclusions
Evaluation	Compare and discriminate between ideas, assess value of theories, make choices based on reasoned argument, verify value of evidence, recognize subjectivity

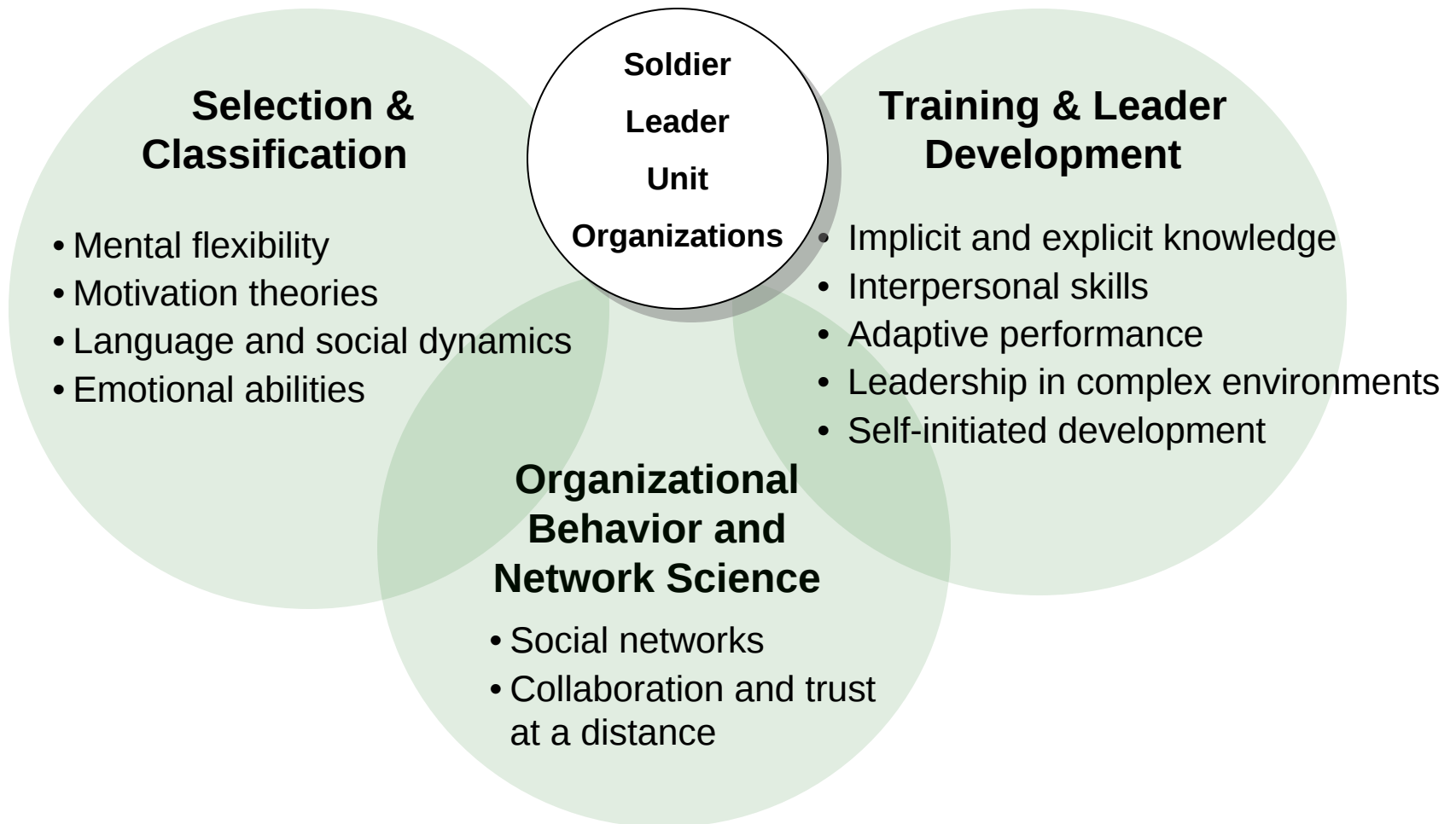
Bloom (1956)



ARI Basic Research



Advance scientific theories, models, methods, measures, and technologies relevant to Army needs.





Learning Theory and Strategies

Conventional warfare	Cold War 'chess moves'	Guerilla warfare	Technology superiority	Network operations	Counter-insurgency Stability operations Major combat ops
1950	1970	1980	2000	Emerging →	
Behaviorism	Cognitivism	Constructivism	Blend	Biopsychosocial	
<u>Theory:</u> Learning occurs through repetition and reinforcement.	<u>Theory:</u> Learning is an information management process.	<u>Theory:</u> Learning occurs by active construction of knowledge not just receiving it.	Integrated/ modified models - Constructivism - Cognitivism - Behaviorism	Holistic theory of - Biology - Psychology - Sociology	
<u>Strategies:</u> Drill and practice Mastery learning	<u>Strategies:</u> Cognitive analysis Structured learning	<u>Strategies:</u> Discovery learning Collaboration Guided experiences		Cyber-psychology Models of human and non-human entities and networks	



U.S. Army Research Institute



Enhancing performance of Soldiers and Units and sustaining a quality all-volunteer Army during an era of persistent conflict.

