



# DEVELOPING YOUR TRAINING ASSESSMENT STRATEGY: CURRENT RESEARCH

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# WHO AM I?

- Founder and CEO of a small business in Orlando, FL
- PhD in Cognitive and Experimental Psychology
- 13 years researching technology for military training and personnel selection

*My job is to research, design, and evaluate emerging technologies to help people learn more effectively.*



The QIC Crew

#### Things we do:

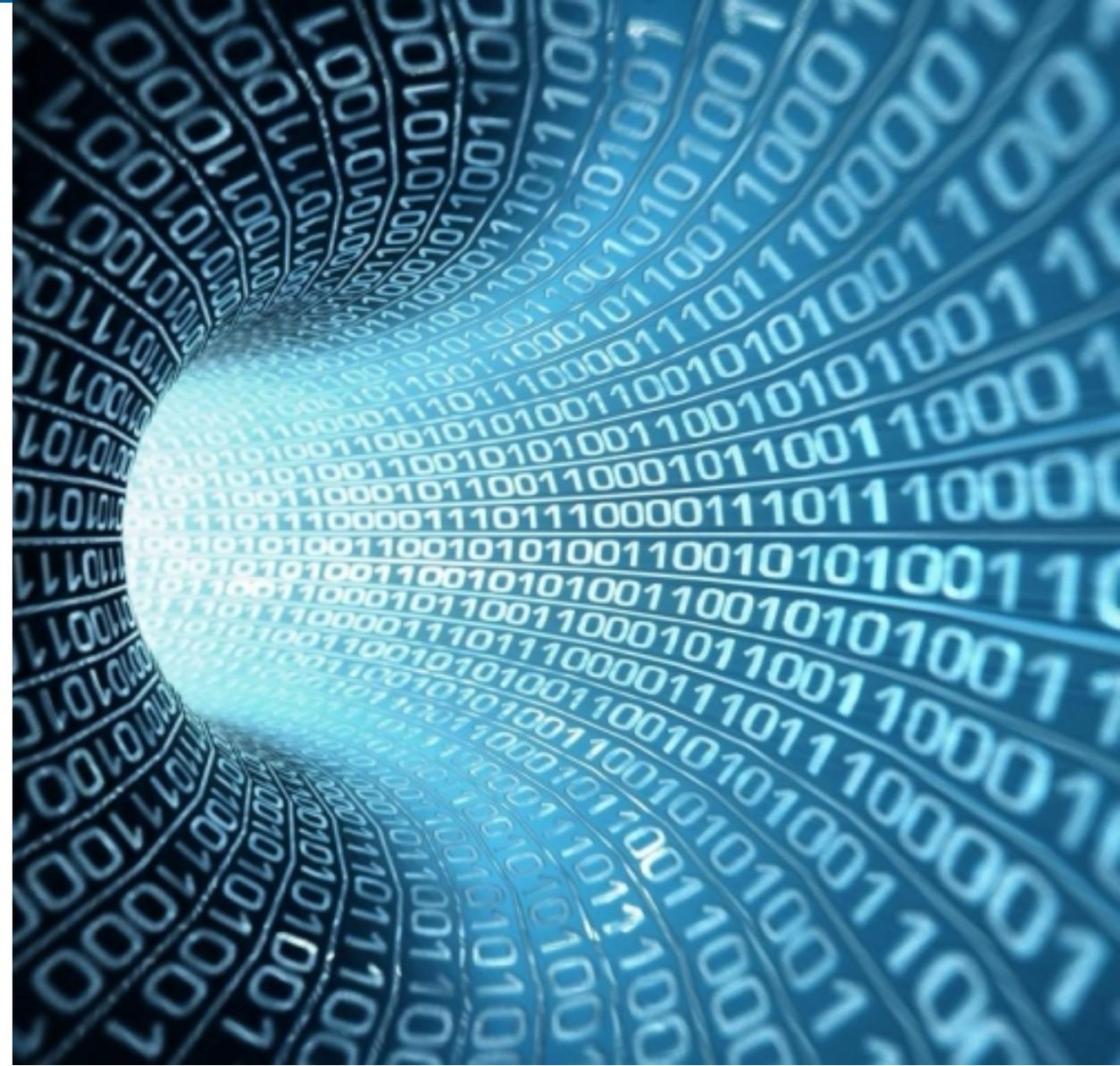
- Training needs analysis
- Performance assessment
- Training effectiveness research

# WHAT WE'RE TALKING ABOUT

## Using data to:

- Predict learning outcomes
- Evaluate training effectiveness

...and other things



# WHAT DO YOU MEAN “DATA?”

**Assessment strategy:** the process of identifying the knowledge, skills, abilities and other characteristics of learners and methods to measure them to determine whether your organizational goals are being met.

## This can include:

- Attitude Surveys
- Knowledge Tests
- Accuracy and Error Rates
- Time on Task
- Frequency of Interactions
- Learning and Forgetting Functions
- Sensor Data
- Communications

**...for starters**



# THINKING LIKE A SCIENTIST

- What is the question you are trying to answer?
- How has this question been answered in the past?
- What do you believe the possible answers to the question might be?
- How would you find out the answer to the question?
- How do you make sense of your results?
- What do you do with the information?

# PREDICTING LEARNING OUTCOMES



# USE CASE: MILITARY MARKSMANSHIP TRAINING

## Why marksmanship?

- For the Army and Marines, basic rifle marksmanship is a required competency.
- One in 4 Soldiers do not qualify during their first record fire.
- Training marksmanship is resource intensive (man-hours, ammunition, ranges, transportation).
- The military is heavily invested in simulator and other training technology to mitigate these costs, but they don't know how well they actually work.



# FACTORS THAT PREDICT LEARNING OUTCOMES

Each learner brings their unique abilities and experiences to a given training event. These include:

- Cognitive Skills
- Physical Abilities
- Psychomotor Skills
- Personality Traits
- Knowledge
- Attitudes
- Experiences

These affect the ability to learn, physical interactions with the training system itself, motivation, etc.

# WHAT SHOULD WE MEASURE?

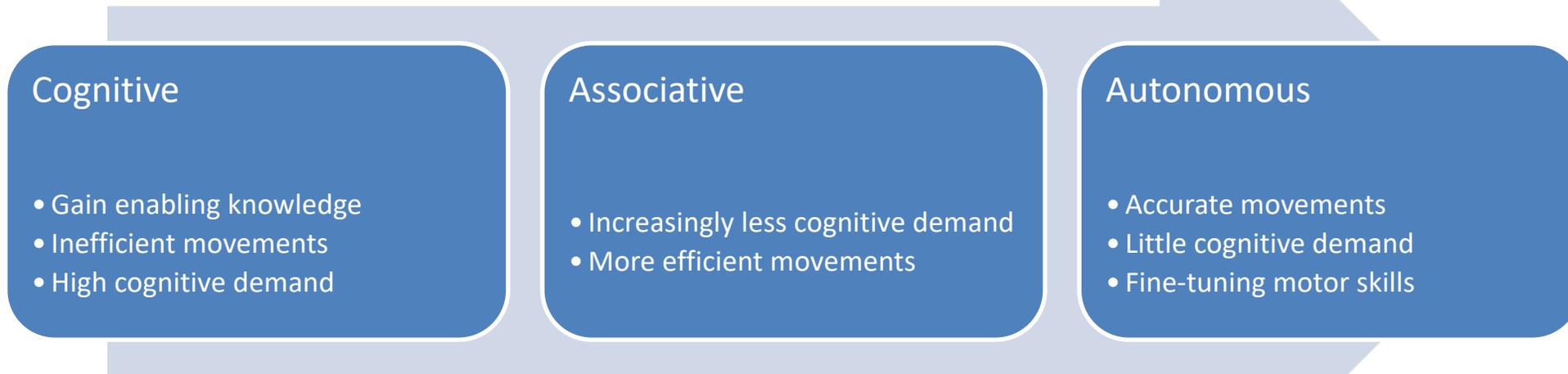
## Front End Analysis Process:

- *Literature review*: Identify research-based factors influencing performance
- *Instructor and SME focus groups*: Understand common problem training problems, instructional strategies, opportunities for improvement
- *Training observations*: Understand practical issues
- *Technology review*: Identify potential technologies for inclusion

# IDENTIFY THEORETICAL FRAMEWORK

## Psychomotor skill acquisition process

Fitts & Posner (1967): 3 Phase model



# ASSESSMENT STRATEGY

## Paper-based tests:

- Demographics: PT scores, Eye dominance, Handedness, Experience with weapons, video-games, sports
- Knowledge: Ballistics, General marksmanship
- Personality: Conscientiousness, Openness to experience
- Attitudes: Self-efficacy, Grit, Perceived Stress, Initiative, Resilience

**Psychomotor skills tests:** Response time, response inhibition, motor speed and accuracy

**Simulator performance data:** Engagement Skills Trainer 2000

**Sensor data:** Aim, Steadiness, Trigger control

**Qualification data:** Practice and Final Qualification scores

# COLLECTING DATA

## Things to consider:

- Whose data do I need?
- How much data will I need?
- How long will the assessment take?
- Can I collect data unobtrusively?
- How will I analyze the data?



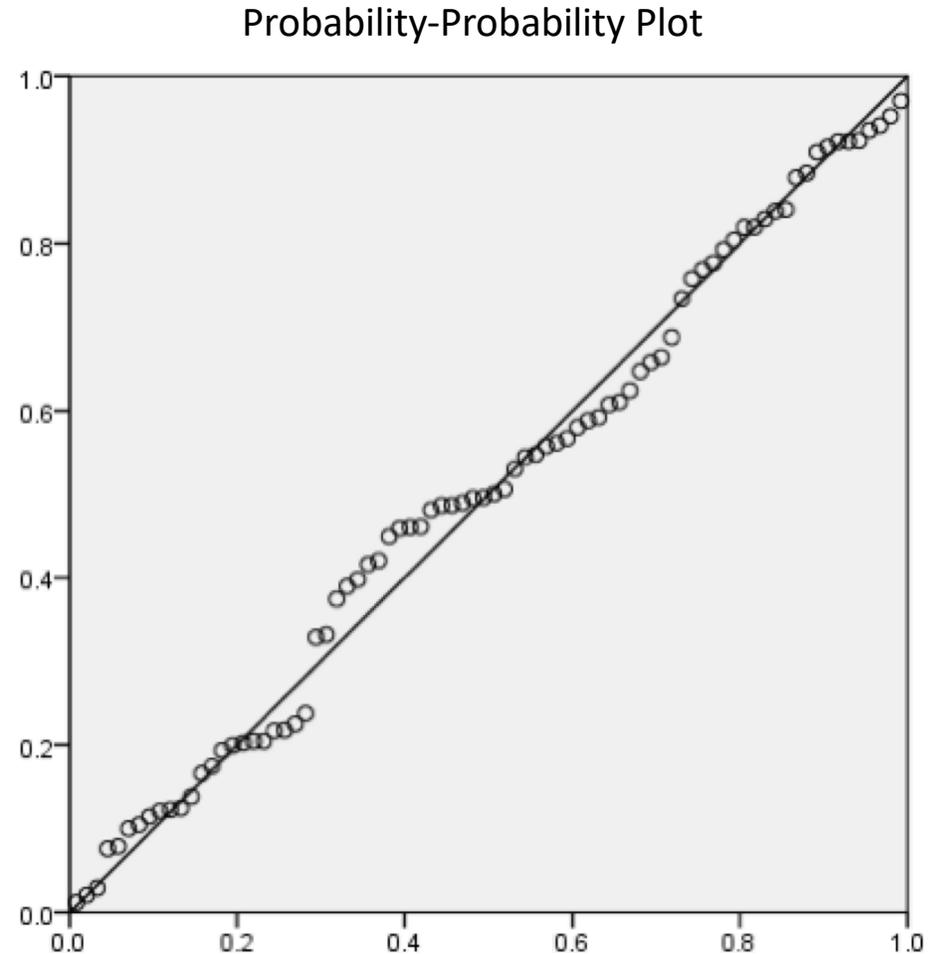
# MODEL DEVELOPMENT

## Common analyses:

- Descriptives
- Correlation
- Regression

What analysis you use depends on the questions you ask

In this model, a regression showed that using paper tests predicts 44% of the variance in qualification scores



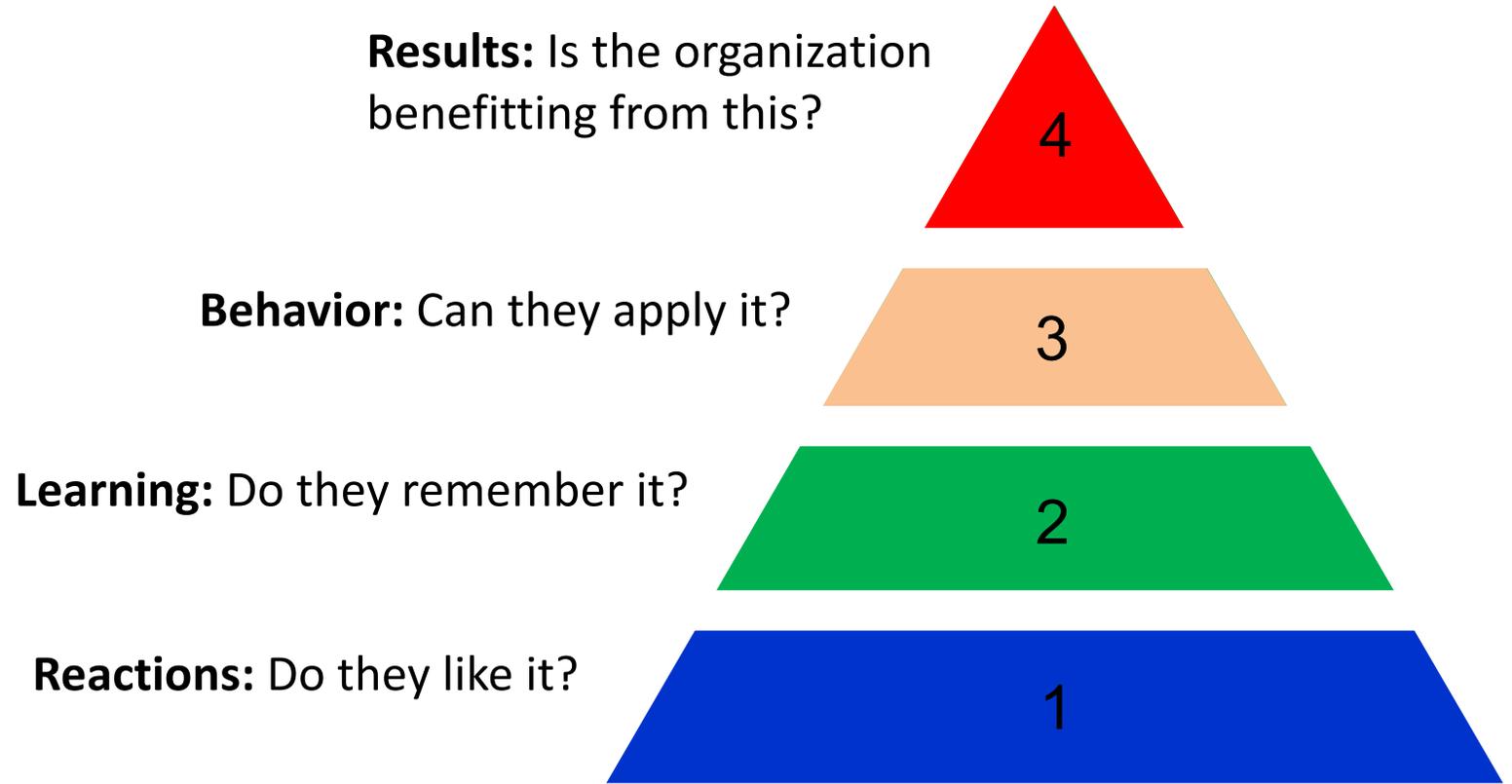
# EVALUATING TRAINING EFFECTIVENESS



# TRADITIONAL TRAINING ASSESSMENTS

Training Effectiveness Evaluation: Research to determine the extent to which a training intervention provides the intended benefit.

*What we do now:*  
Kirkpatrick's 4 Levels



# CONSIDER THIS...

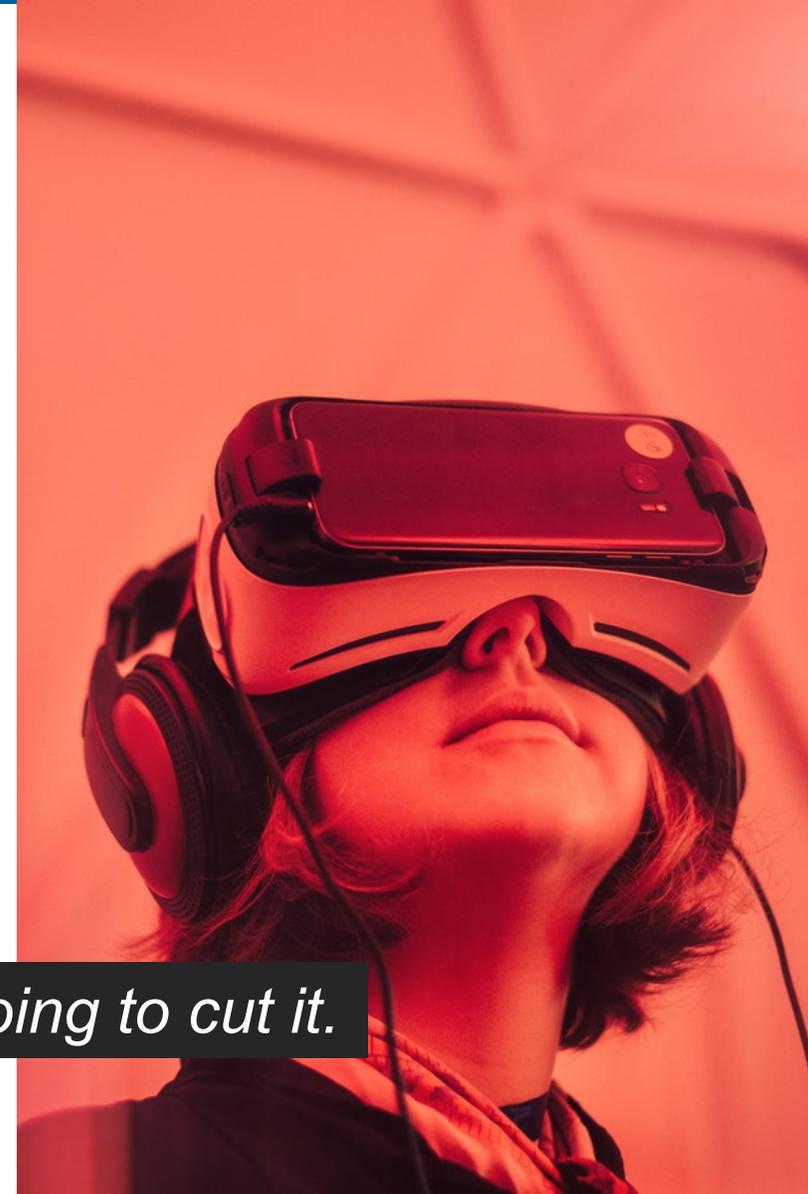


# MEASURING PERFORMANCE IN IMMERSIVE ENVIRONMENTS

Immersive environments (e.g. AR, VR, simulations) vary from traditional learning platforms in important ways. Learning experiences in these technologies is:

- Difficult to standardize
- Highly personal
- Inherently adaptive
- Dependent upon improvisation
- Collaborative

*Traditional assessment strategies are NOT going to cut it.*



# WHAT TO MEASURE BEFORE WE TRAIN

Each learner brings their unique abilities and experiences to a given training event.

These include:

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- Physical Abilities
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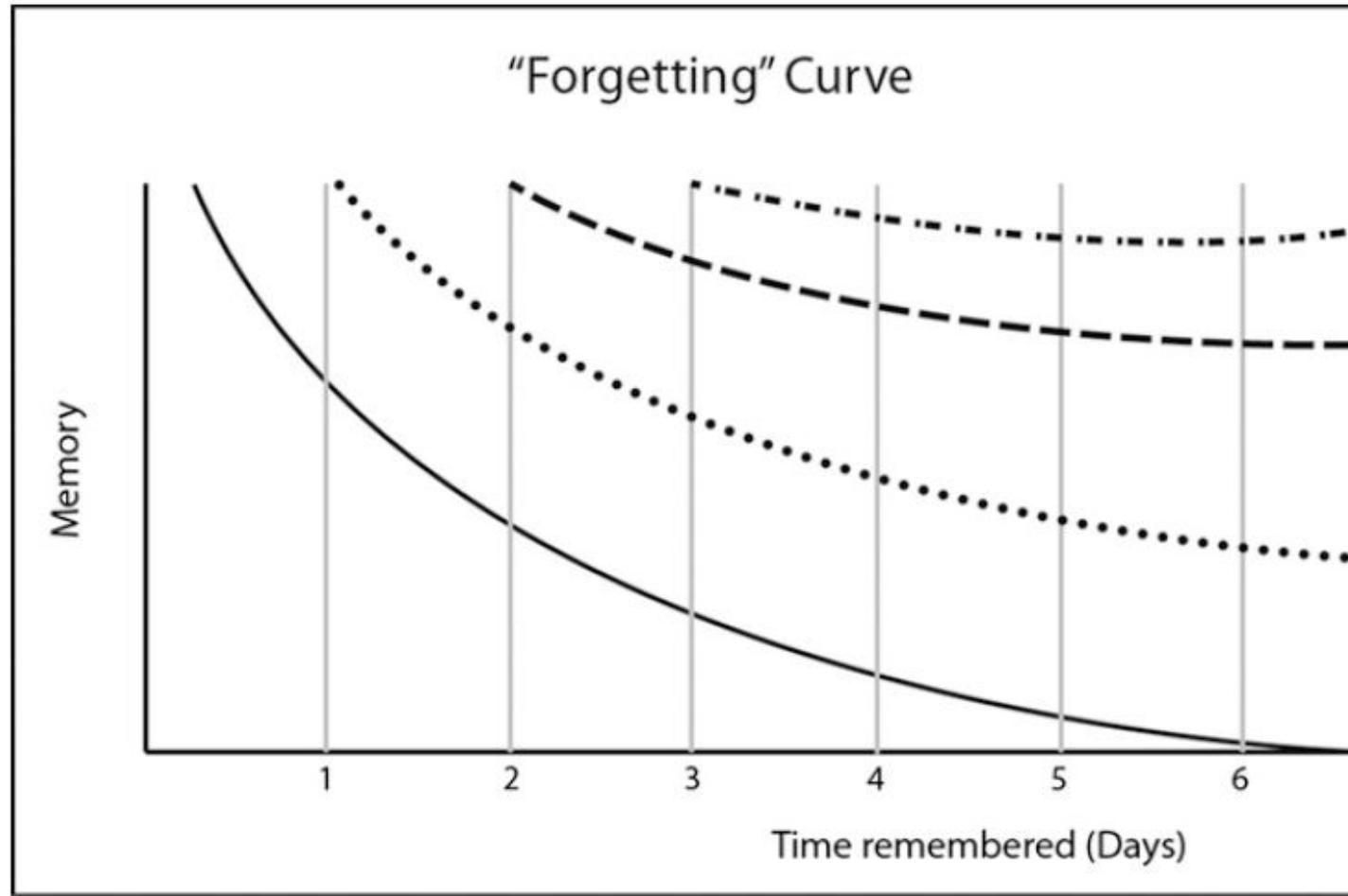
# PERFORMANCE VARIABLES

Measures of what aspects of the learner *change* during the training process.

- Cognitive
- Psychomotor
- Affective
- Attitudinal
- Social

*You can develop your own! You just need to validate them.*

# RETENTION AND FORGETTING



A la Ebbinghaus (1885)

# INSIGHT AND SHIFTING STRATEGIES

*Insight* refers to learning that takes place quickly, without overt trial-and-error testing (“a-ha” moments)

We can pinpoint shifts in behavior where strategies change.



Kohler's chimpanzees (1951)

# ATTITUDINAL VARIABLES: SELF-EFFICACY

*Self-Efficacy* refers to the extent to which you are confident in your knowledge or ability to do something. This is measured through a self-report questionnaire.

As training progresses, you should feel more confident in your skills.

- Need to measure multiple times throughout the training process



# USE CASE: GUNNERY TRAINING SIMULATOR

## Why?

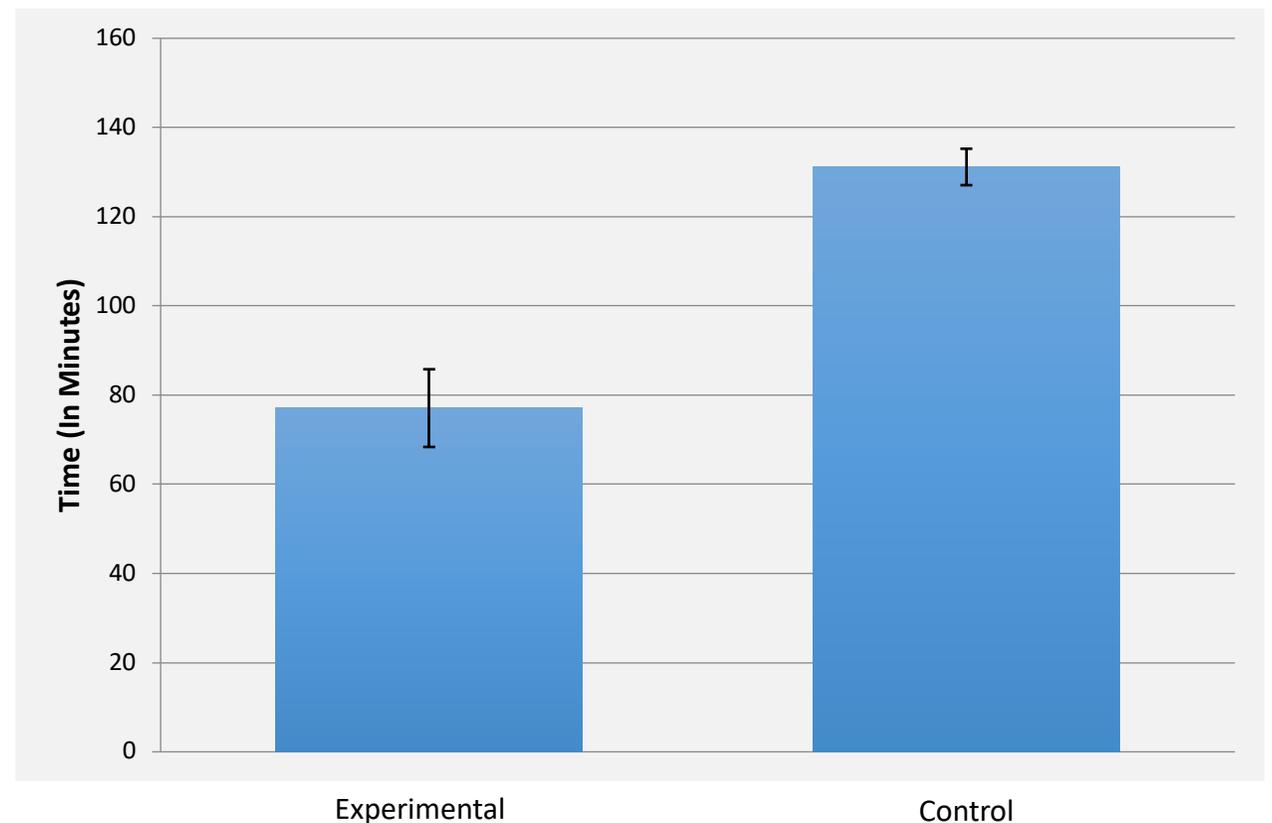
- Gunnery involves training an individual *and* a three-person crew
- Live training is very costly, but so is the simulator



# FRAMING THE RESEARCH QUESTION

## What is the outcome you want to see?

- In this case, we were interested in whether an experimental curriculum would make training more *efficient*.
- Experimental and Control groups
- While performance was comparable, the Experimental group took nearly an hour less time to complete the training



# SOLVING PROBLEMS WITH DATA

*How can you use data in your organization to make it run more efficiently?*

