

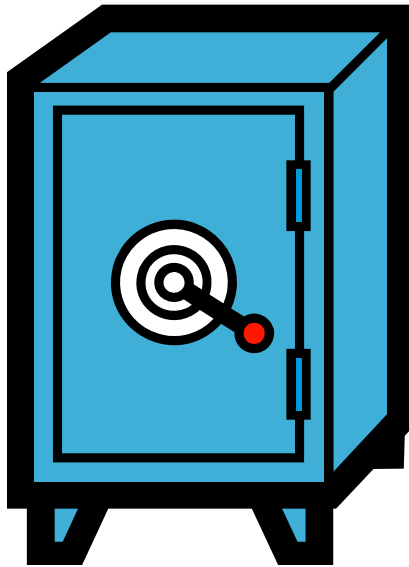
# Improving Exam Security With Performance Items: Knowing is Doing

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Alpine Testing Solutions

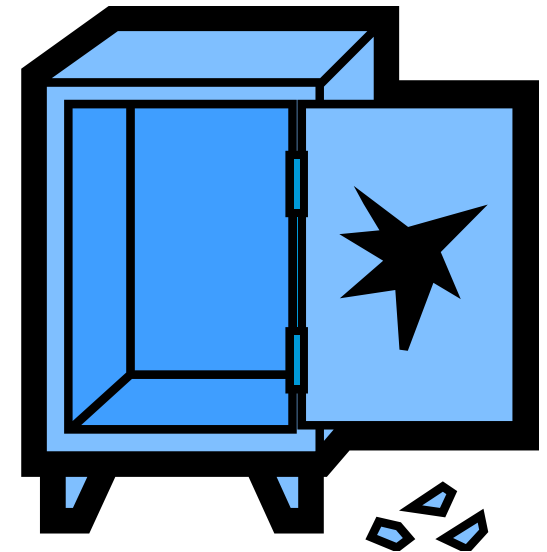
# Security of Performance Items

Less memorable,  
more secure!



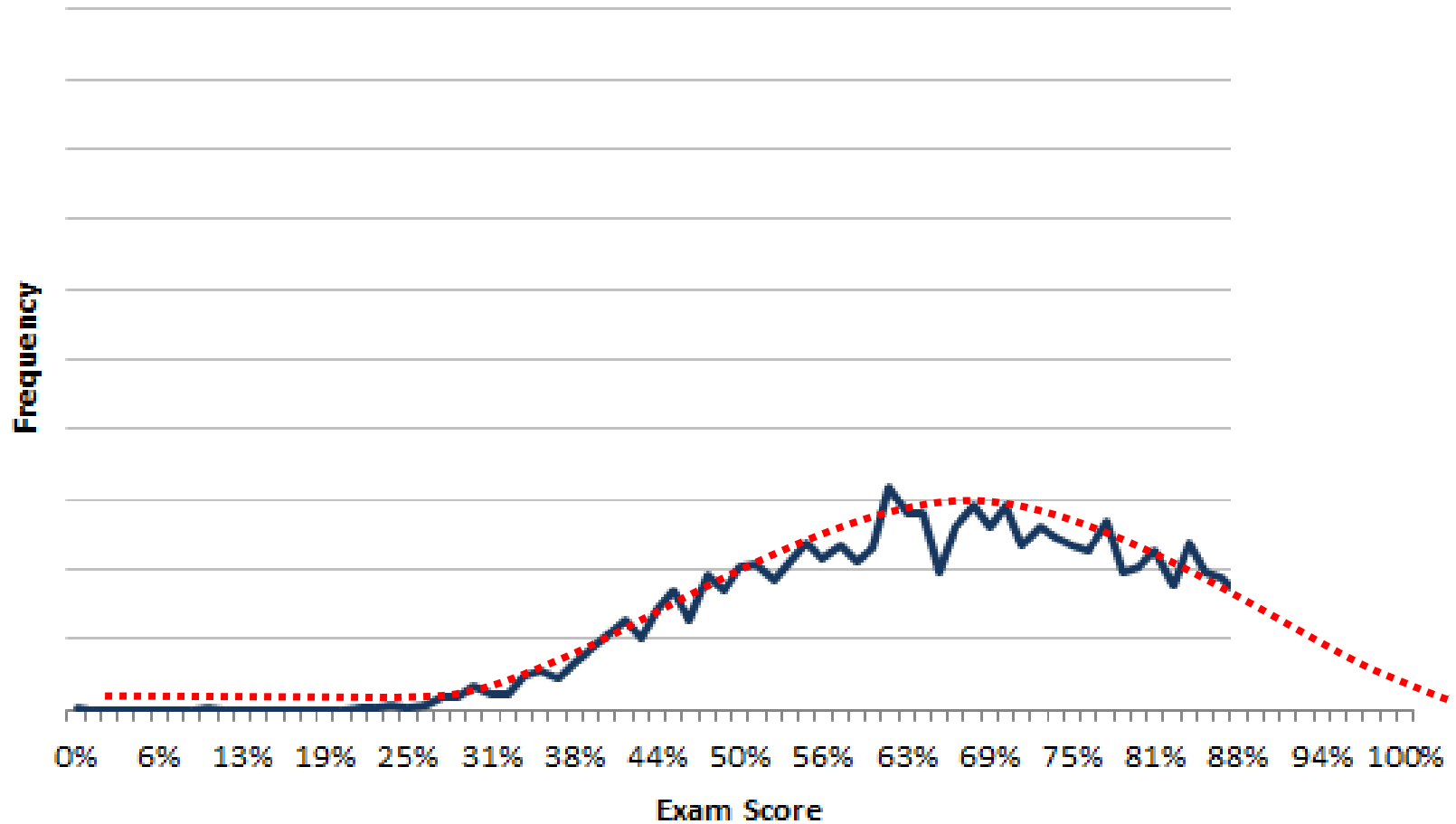
Vs.

More memorable,  
less secure!



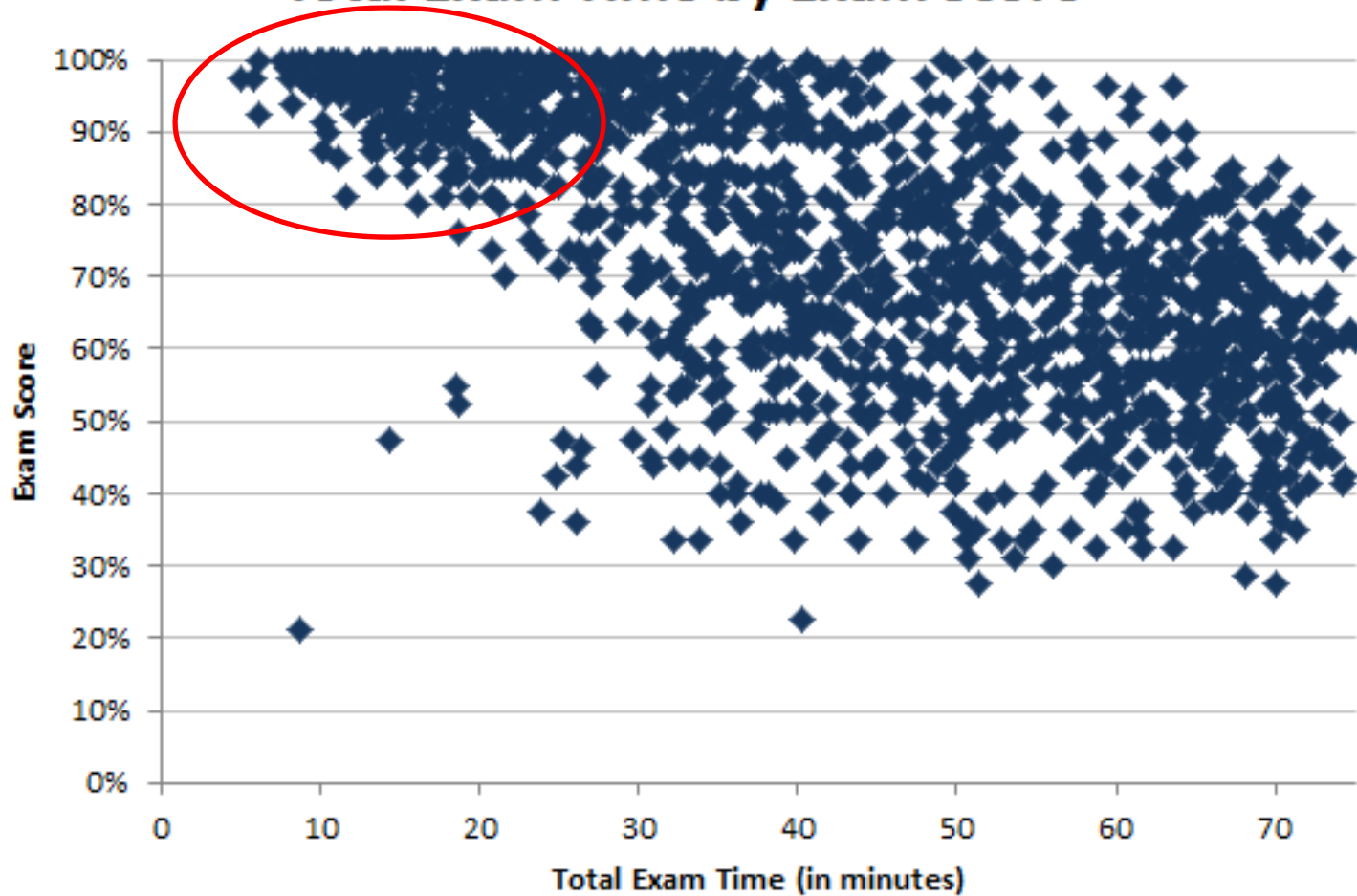
# Context: Security

## Frequency Distribution

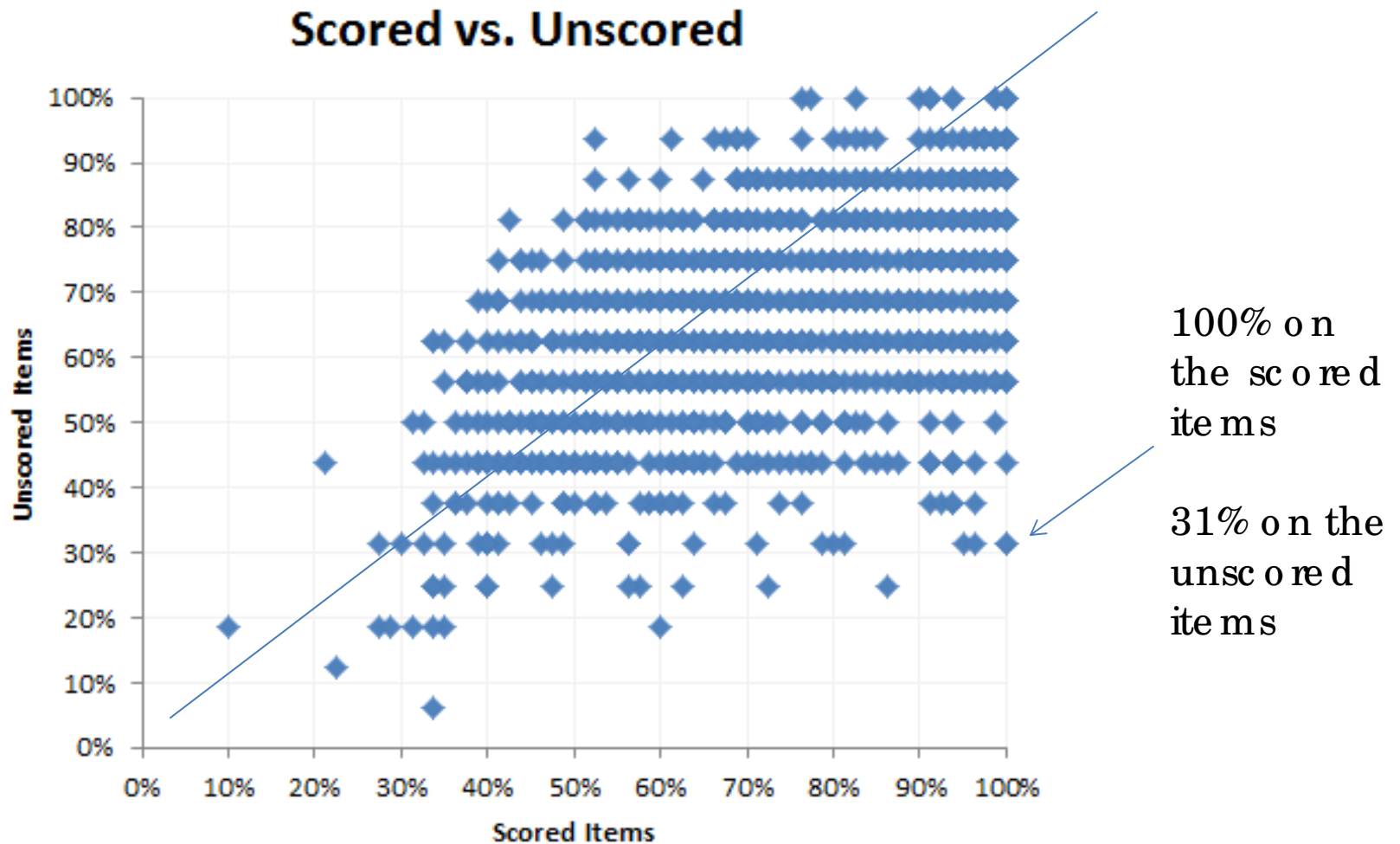


# Context: Security

## Total Exam Time by Exam Score

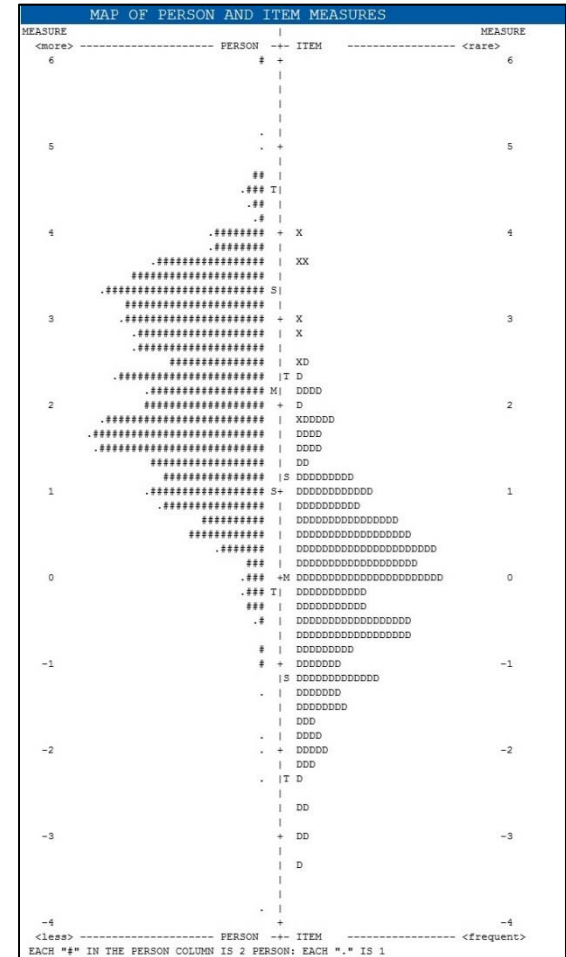
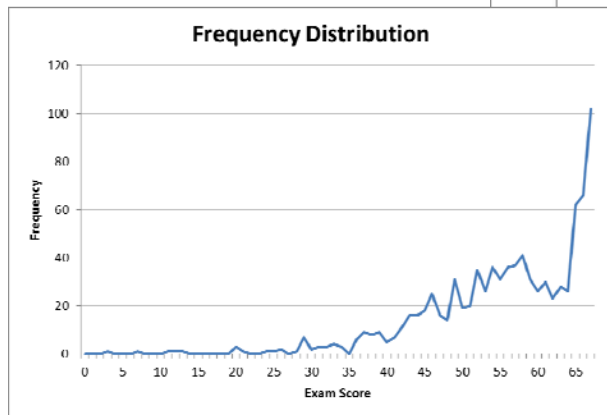
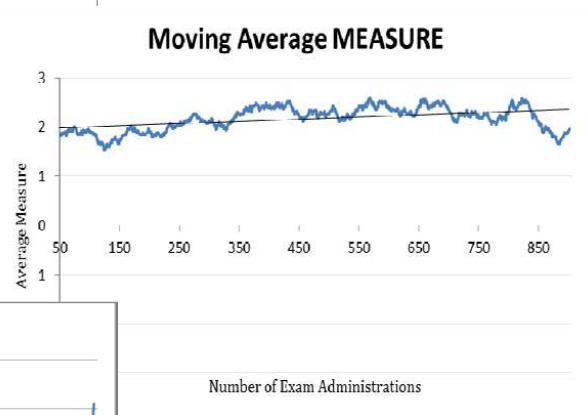
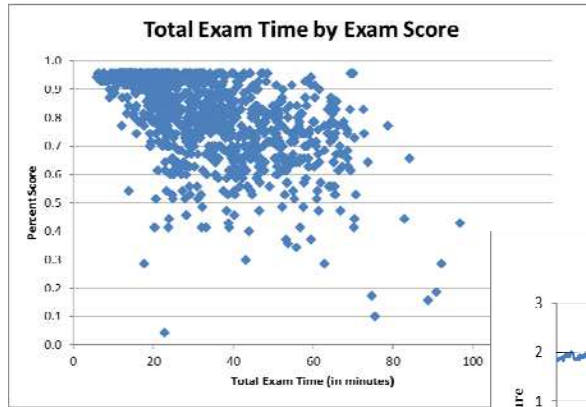


# Context: Security



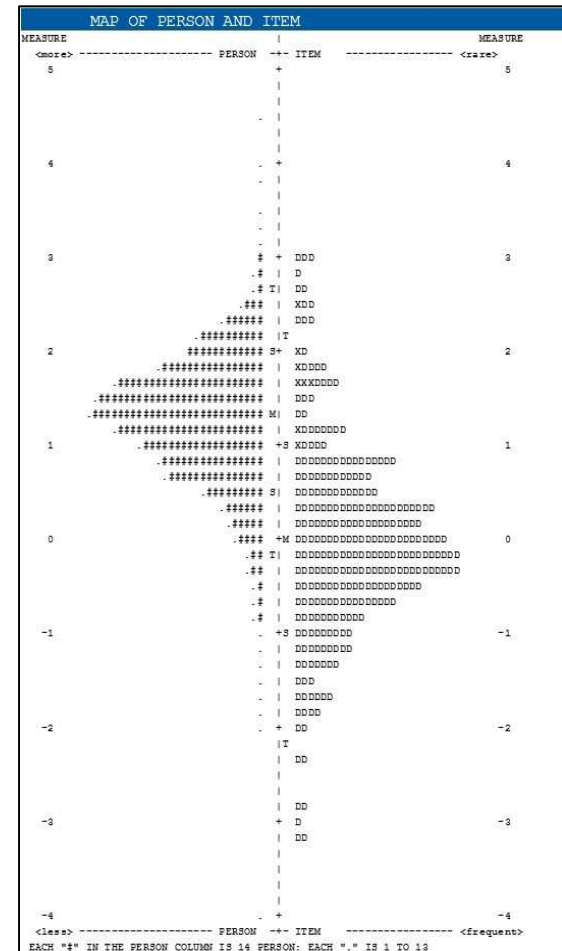
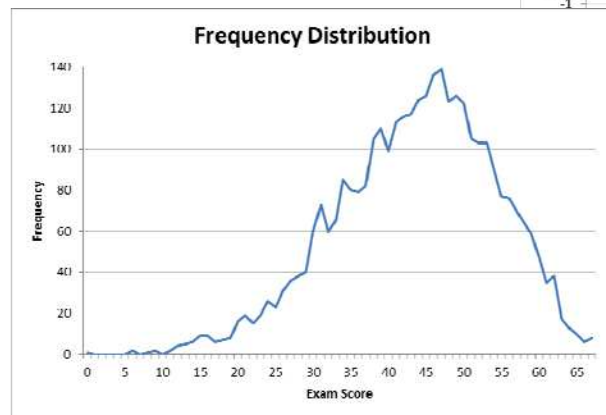
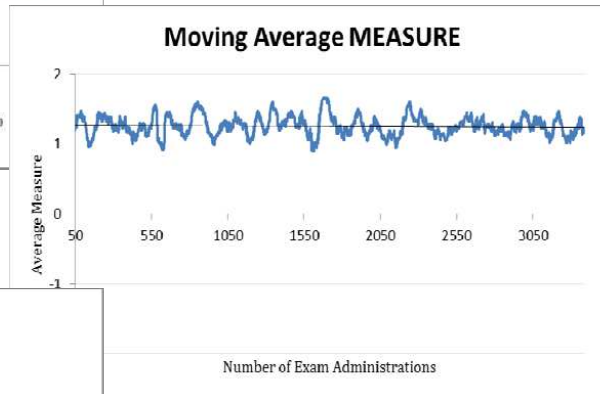
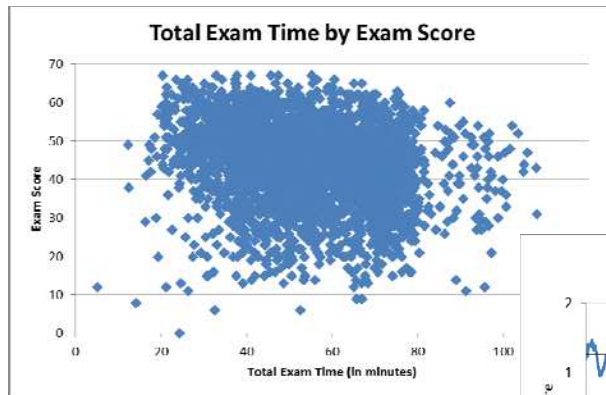
# Context: Security

- Multiple indicators of security and item exposure issues



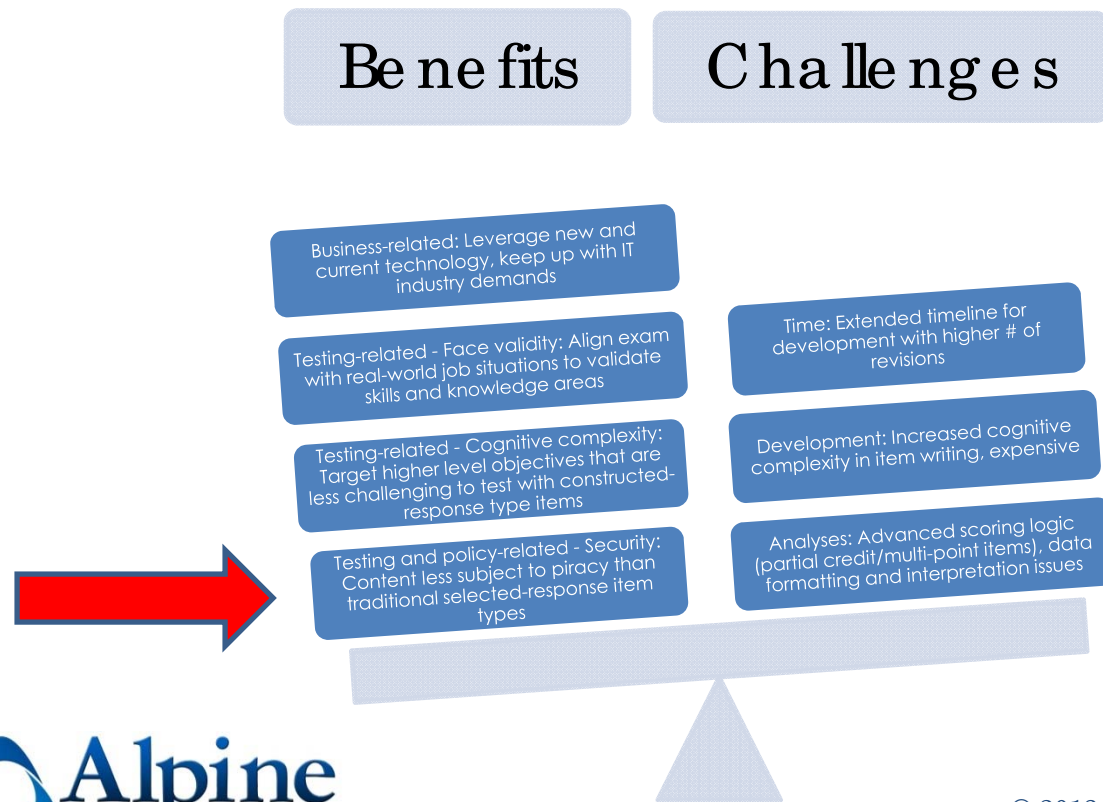
# Context: Security

- Improvement in security and item exposure indicators



# Context: Performance Items

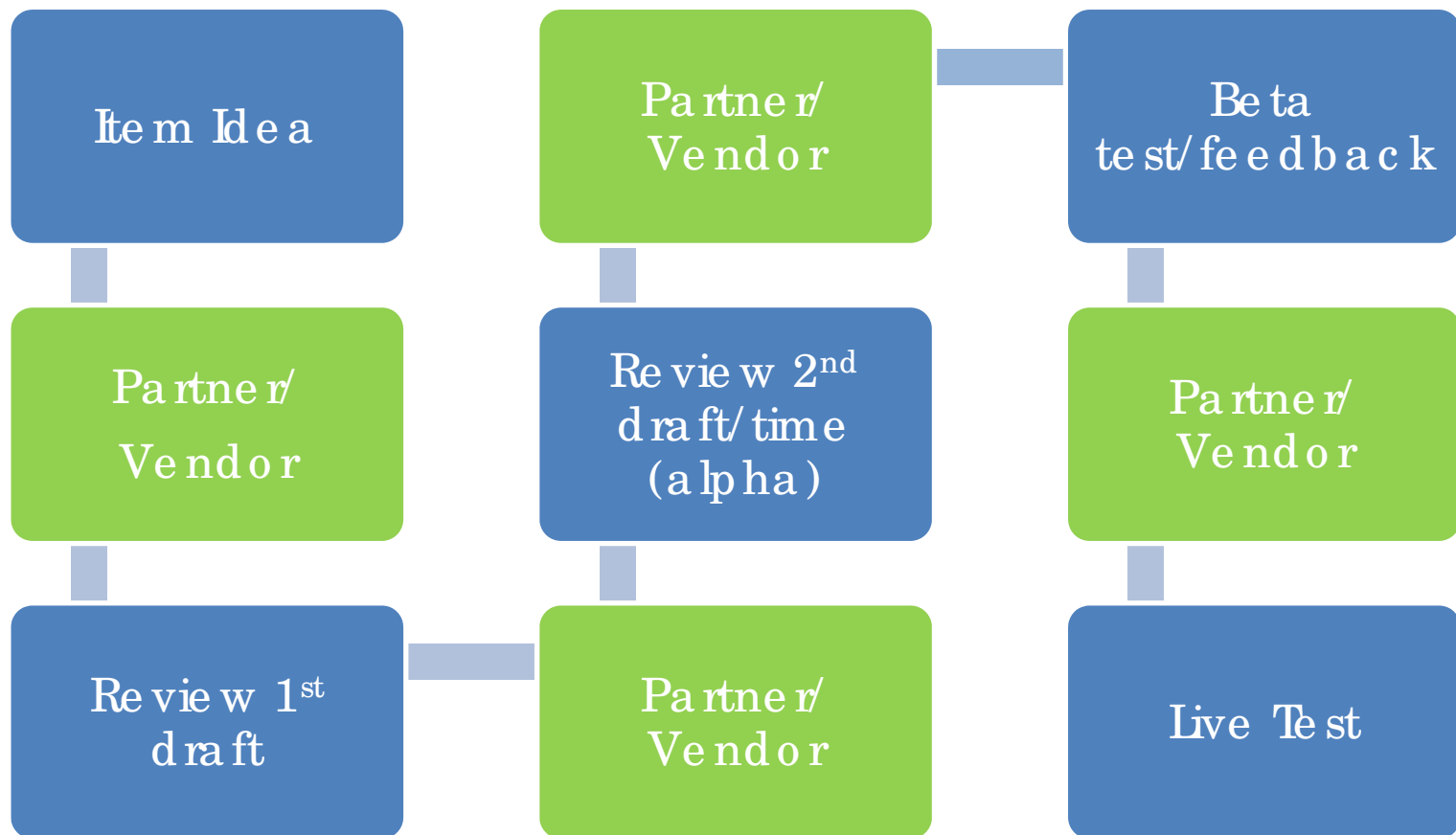
- Use when most appropriate way to measure the skill set of interest
- Can increase the value of an exam, add value to the industry, and support new generations of certifications





# Context: Performance Items

- Assumes an iterative item development approach grounded in a validity framework



# Context: Performance Items

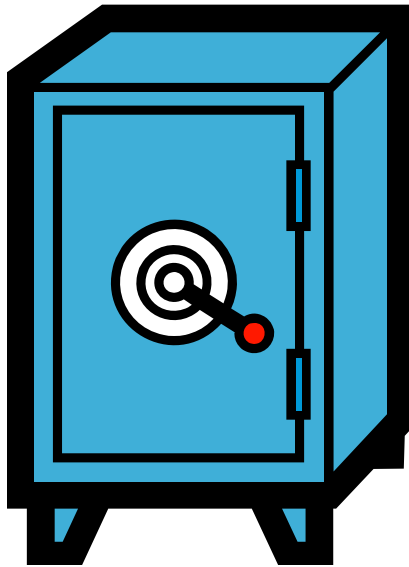
## Scoring

|                               |                            |
|-------------------------------|----------------------------|
| <b>Possible Points</b>        | 5                          |
| <b>Scoring Opportunities</b>  | 3 (worth 1, 2, & 2 points) |
| <b>Average Item Score</b>     | 1.81                       |
| <b>Item-Score Correlation</b> | .46                        |
| <b>Median Response Time</b>   | 355 seconds                |

| SIM | option                  | p-value | correlation | avg. time | 12 to 49 | 50 to 60 | 61 to 68 | 69 to 74 | 75 to 92 |
|-----|-------------------------|---------|-------------|-----------|----------|----------|----------|----------|----------|
| 5   | "<response status=""... | 0.137   | 0.283       | 350       | 1        |          | 1        | 3        | 5        |
| 4   | "<response status=""... | 0.014   | 0.071       | 385       |          |          |          | 1        |          |
| 3   | "<response status=""... | 0.014   | -0.048      | 252       |          | 1        |          |          |          |
| 3   | "<response status=""... | 0.014   | 0.062       | 345       |          |          |          | 1        |          |
| 3   | "<response status=""... | 0.014   | 0.272       | 808       |          |          |          |          | 1        |
| 3   | "<response status=""... | 0.027   | 0.211       | 376       |          |          | 1        |          | 1        |
| 3   | "<response status=""... | 0.014   | 0.043       | 327       |          |          | 1        |          |          |
| 3   | "<response status=""... | 0.110   | 0.119       | 379       | 2        | 1        |          | 3        | 2        |
| 3   | "<response status=""... | 0.027   | -0.016      | 658       |          | 1        | 1        |          |          |
| 2   | "<response status=""... | 0.014   | -0.167      | 335       | 1        |          |          |          |          |

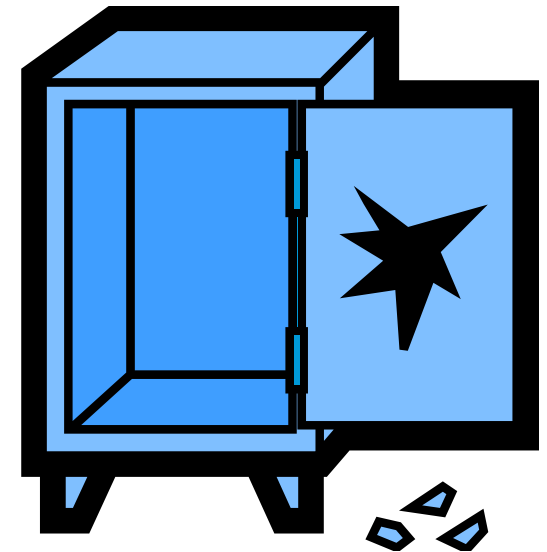
# Security of Performance Items

Less memorable,  
more secure!

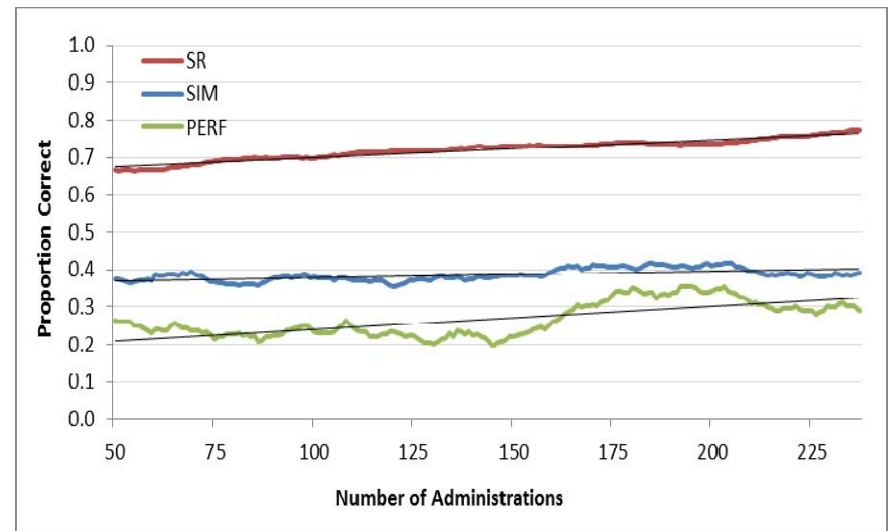
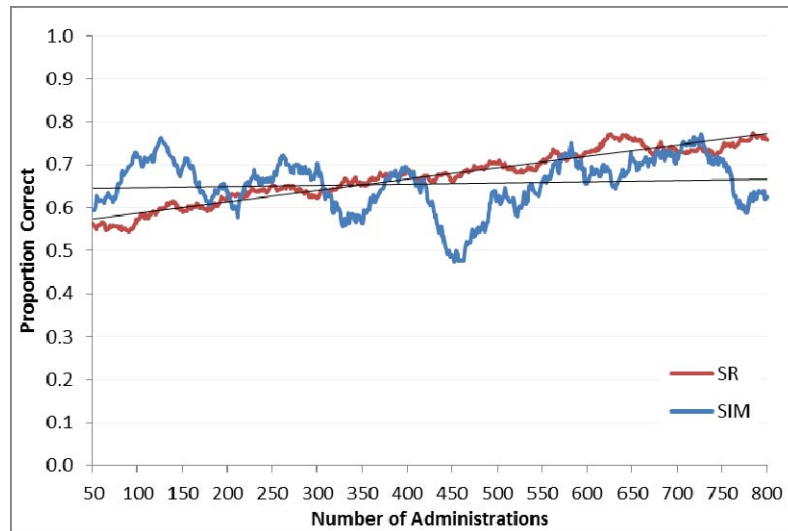
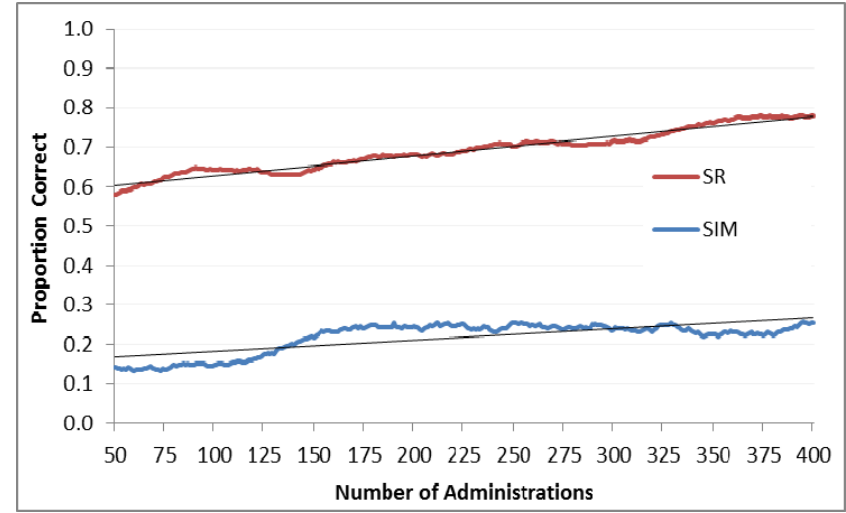
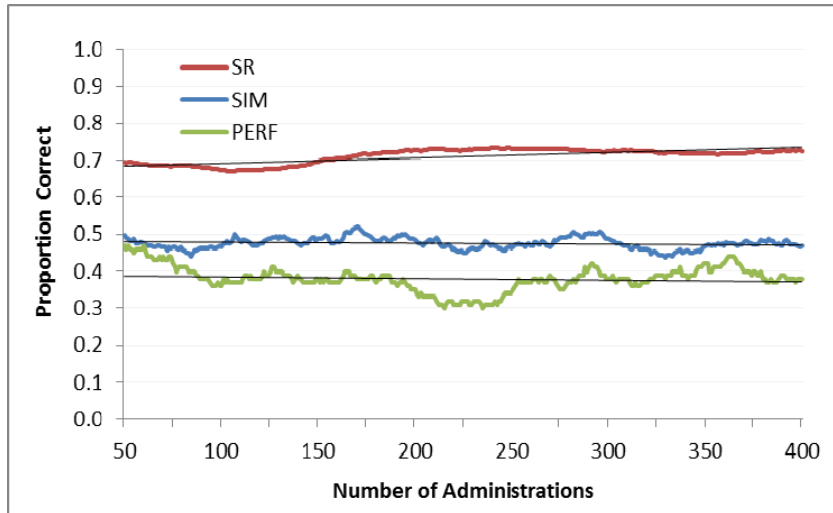


Vs.

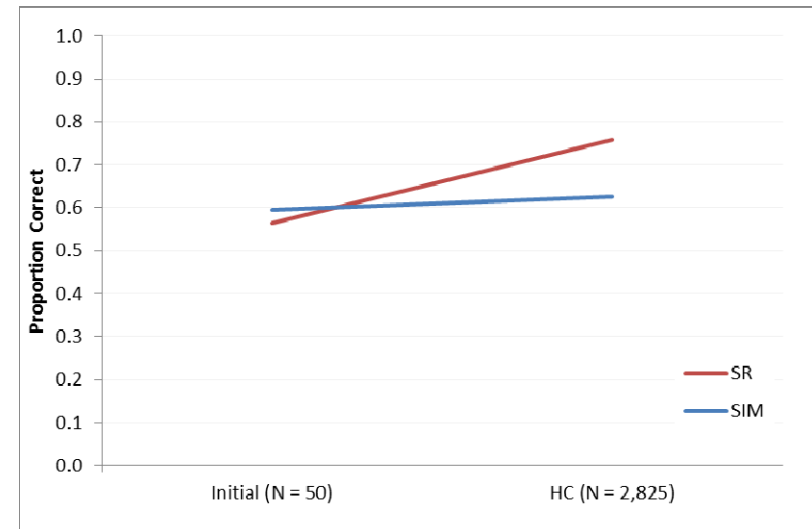
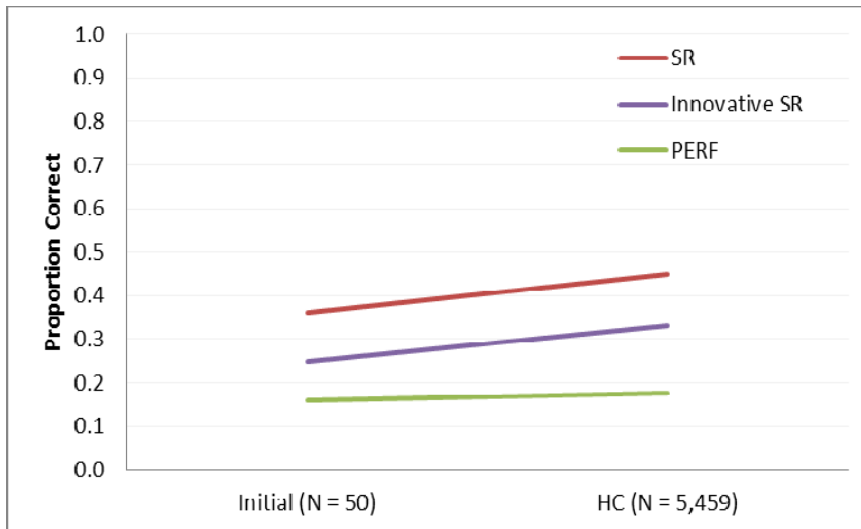
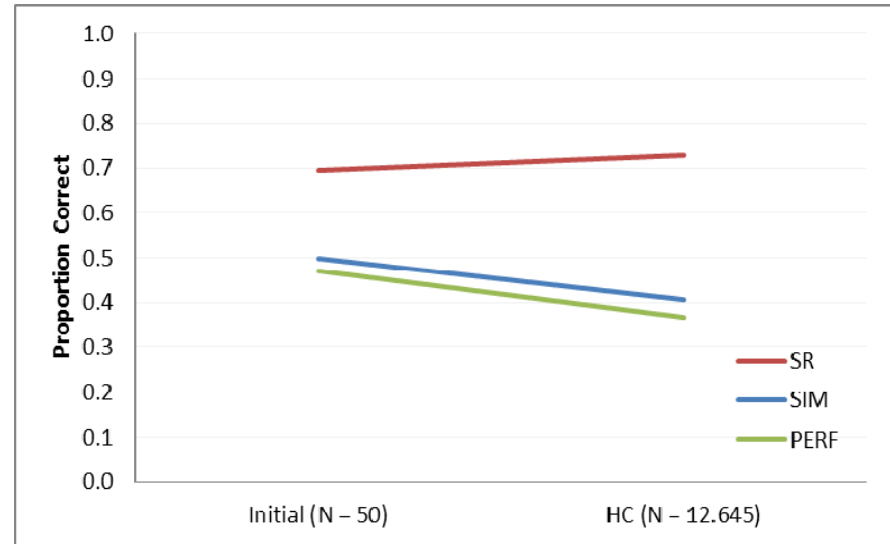
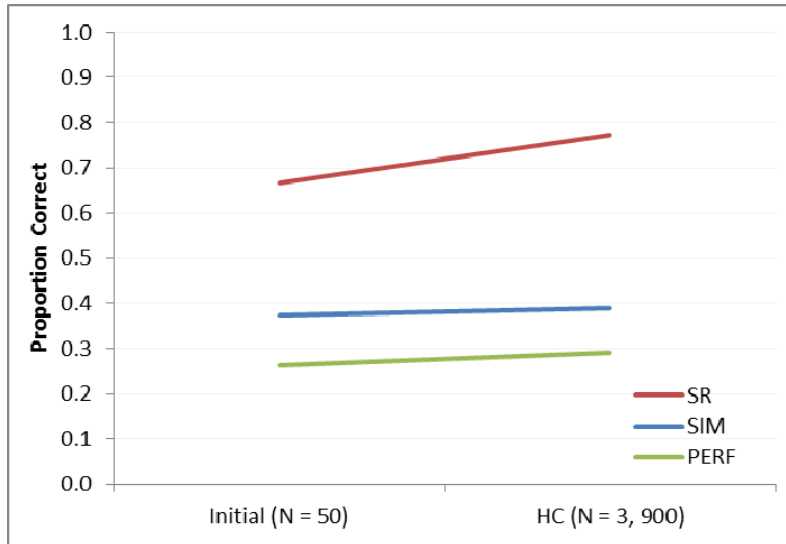
More memorable,  
less secure!



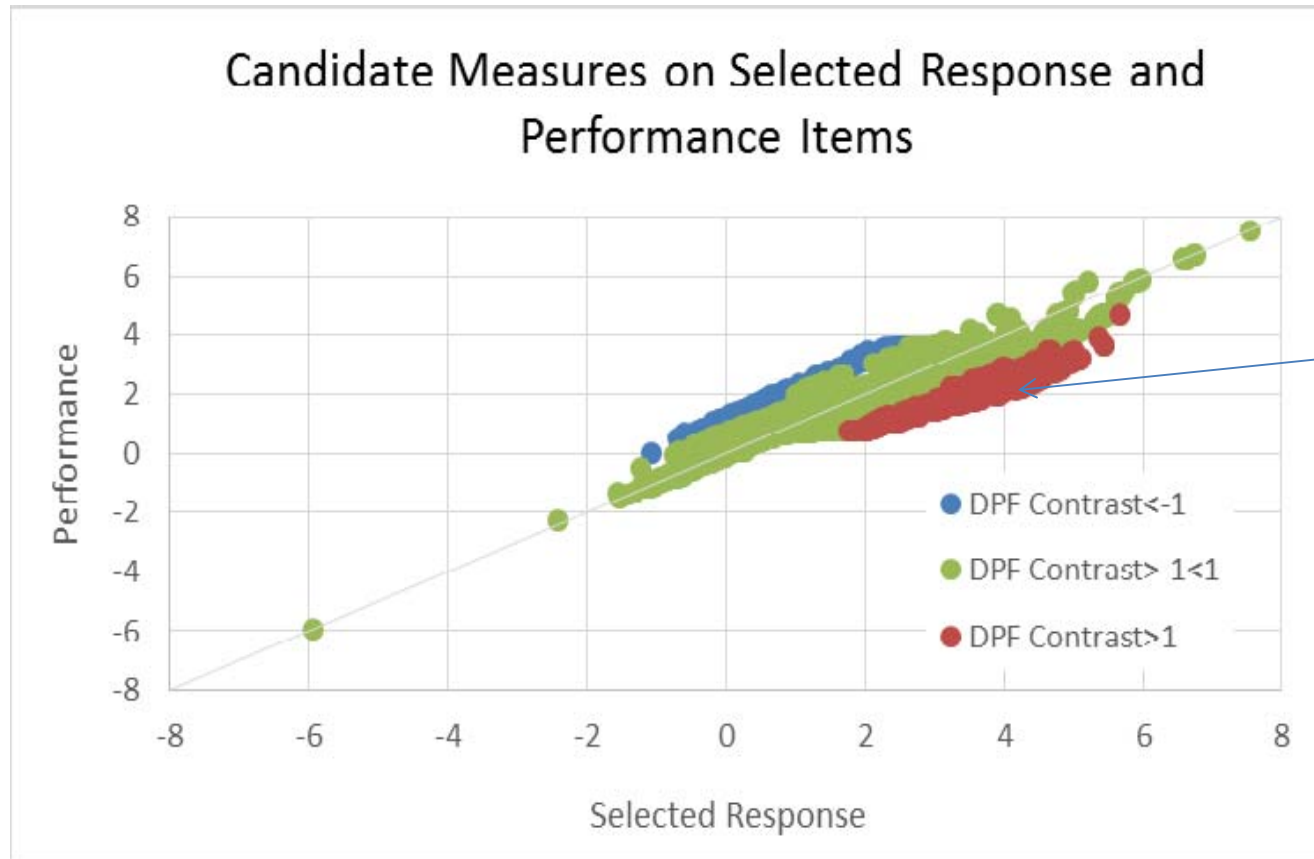
# Moving Averages



# Item Parameter Drift



# Differential Person Functioning Performance Items

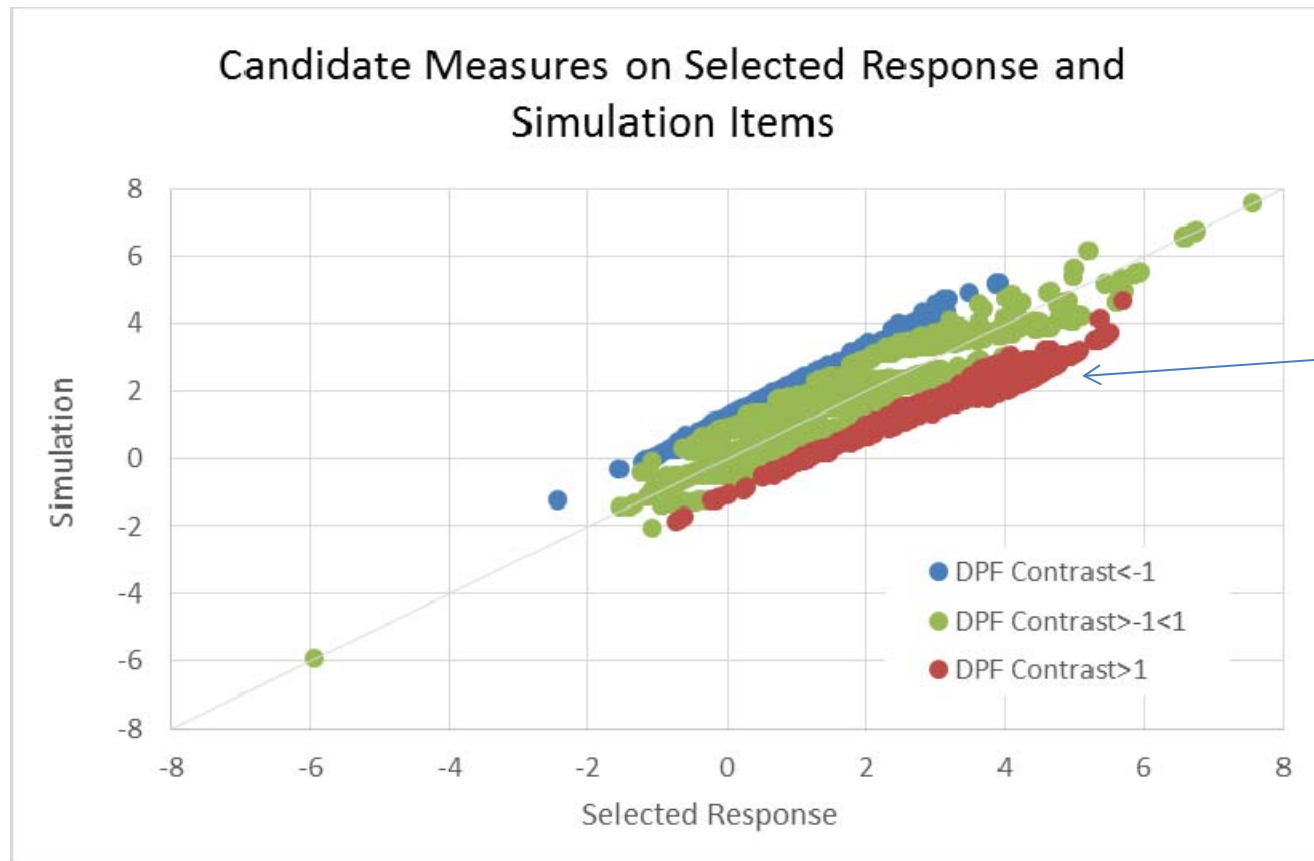


Selected  
response item  
measure = 4.15

Performance  
item measure =  
2.15

Contrast = 2.00

# Differential Person Functioning Simulation Items



Selected  
response item  
measure = 4.77

Simulation item  
measure = 2.81

Contrast = 1.96

# DPF & DIF in Context

- Identify “most secure” items on the exam
  - 10% of items displayed negative DIF against candidates flagged for differential performance by item type

| Item ID | Item Type | No DPF Flag<br>DIF Measure | Double DPF          |                      |                          | DPF Flag -         |                     |                         | DPF Flag -          |                      |                          |
|---------|-----------|----------------------------|---------------------|----------------------|--------------------------|--------------------|---------------------|-------------------------|---------------------|----------------------|--------------------------|
|         |           |                            | Flag DIF<br>Measure | Flag DIF<br>Contrast | Double DPF<br>Flag Prob. | SIM DIF<br>Measure | SIM DIF<br>Contrast | DPF Flag -<br>SIM Prob. | PERF DIF<br>Measure | PERF DIF<br>Contrast | DPF Flag -<br>PERF Prob. |
| N627655 | SIM       | 0.32                       | 3.12                | -2.80                | 0.00                     | 3.12               | -2.80               | 0.00                    |                     |                      |                          |
| N62745  | SIM       | -0.38                      | 2.37                | -2.75                | 0.00                     | 2.37               | -2.75               | 0.00                    |                     |                      |                          |
| N62716  | SIM       | 3.40                       | 6.16                | -2.75                | 0.00                     | 6.12               | -2.72               | 0.00                    |                     |                      |                          |
| N6279   | SIM       | 1.08                       | 3.77                | -2.69                | 0.00                     | 4.06               | -2.98               | 0.00                    |                     |                      |                          |
| N110444 | PERF      | 0.77                       | 3.44<               | -2.67                | 0.00                     |                    |                     |                         |                     |                      |                          |
| N110445 | PERF      | 2.01                       | 4.66<               | -2.66                | 0.00                     |                    |                     |                         |                     |                      |                          |
| N627444 | SIM       | -0.20                      | 2.43                | -2.63                | 0.00                     | 2.43               | -2.63               | 0.00                    |                     |                      |                          |
| N100998 | SR        | -1.85                      | 0.42                | -2.28                | 0.04                     | -0.21              | -1.64               | 0.02                    |                     |                      |                          |
| N62743  | SIM       | 3.34                       | 5.59                | -2.25                | 0.00                     | 5.82               | -2.48               | 0.00                    |                     |                      |                          |
| N110953 | SR        | -1.64                      | 0.61                | -2.25                | 0.04                     | 0.20               | -1.84               | 0.01                    |                     |                      |                          |
| N27046  | SR        | -0.99                      | 1.24                | -2.23                | 0.01                     | 0.49               | -1.47               | 0.00                    |                     |                      |                          |
| N147465 | PERF      | 1.52                       | 3.75<               | -2.23                | 0.00                     |                    |                     |                         |                     |                      |                          |
| N110845 | SR        | -0.58                      | 1.47                | -2.04                | 0.01                     | 0.87               | -1.45               | 0.00                    |                     |                      |                          |
| N31008  | SR        | 0.29                       | 1.63                | -1.34                | 0.01                     | 1.72               | -1.43               | 0.00                    |                     |                      |                          |
| N33635  | SR        | -0.74                      | 0.41                | -1.16                | 0.00                     |                    |                     |                         | 0.63                | -1.37                | 0.02                     |



# DPF & DIF in Context

- Identify “most compromised” items on the exam
  - 27% of items displayed DIF in favor of candidates flagged for differential performance by item type

| Item ID | Item Type | No DPF Flag<br>DIF Measure | Double DPF          |                      |                          | DPF Flag -         |                     |                         | DPF Flag -          |                      |                          |
|---------|-----------|----------------------------|---------------------|----------------------|--------------------------|--------------------|---------------------|-------------------------|---------------------|----------------------|--------------------------|
|         |           |                            | Flag DIF<br>Measure | Flag DIF<br>Contrast | Double DPF<br>Flag Prob. | SIM DIF<br>Measure | SIM DIF<br>Contrast | DPF Flag -<br>SIM Prob. | PERF DIF<br>Measure | PERF DIF<br>Contrast | DPF Flag -<br>PERF Prob. |
| N31767  | SR        | 1.49                       | -0.74               | 2.23                 | 0.00                     | -0.54              | 2.03                | 0.00                    | -0.42               | 1.91                 | 0.00                     |
| N31859  | SR        | 1.67                       | -0.47               | 2.14                 | 0.00                     | 0.49               | 1.19                | 0.00                    | 0.65                | 1.03                 | 0.04                     |
| N31876  | SR        | 0.89                       | -1.22               | 2.11                 | 0.00                     | -0.37              | 1.26                | 0.00                    | -0.55               | 1.44                 | 0.00                     |
| N33589  | SR        | 1.81                       | -.30>               | 2.11                 | 0.01                     |                    |                     |                         |                     |                      |                          |
| N110895 | SR        | 0.73                       | -1.34>              | 2.07                 | 0.00                     | -0.62              | 1.34                | 0.00                    |                     |                      |                          |
| N110460 | SR        | 0.57                       | -1.48>              | 2.05                 | 0.00                     |                    |                     |                         | -1.32>              | 1.89                 | 0.03                     |
| N17134  | SR        | 0.68                       | -1.36>              | 2.04                 | 0.00                     |                    |                     |                         | -1.24>              | 1.92                 | 0.03                     |
| N33455  | SR        | 0.60                       | -1.42>              | 2.02                 | 0.00                     |                    |                     |                         | -1.28>              | 1.88                 | 0.03                     |
| N1727   | SR        | 0.31                       | -1.67>              | 1.98                 | 0.00                     |                    |                     |                         |                     |                      |                          |
| N17191  | SR        | 0.49                       | -1.49>              | 1.98                 | 0.00                     |                    |                     |                         |                     |                      |                          |
| N17181  | SR        | 1.80                       | -.19>               | 1.98                 | 0.02                     |                    |                     |                         |                     |                      |                          |
| N10738  | SR        | 1.18                       | -0.77               | 1.95                 | 0.00                     |                    |                     |                         |                     |                      |                          |
| N13374  | SR        | 1.57                       | -0.37               | 1.94                 | 0.00                     | 0.14               | 1.43                | 0.00                    | 0.03                | 1.54                 | 0.01                     |
| N13394  | SR        | -0.66                      | -2.57>              | 1.91                 | 0.01                     |                    |                     |                         |                     |                      |                          |
| N17103  | SR        | 1.52                       | -0.38               | 1.90                 | 0.00                     | 0.39               | 1.13                | 0.00                    | 0.02                | 1.50                 | 0.01                     |

# Pre lim in a ry C o n c l u s i o n s

- Performance items are both more stable and more difficult than selected-response type items
  - Items' cognitive complexity appears to affect exposure over time and item parameter drift
- Exposure problems lead to downstream implications for item and form analysis
- Prevention, detection, enforcement should be focus of a comprehensive security plan

# Contact Information

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