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From ETS Guide to Use of Scores: “Any GRE test, however, has two primary limitations:

It is an inexact measure; only score differences that exceed the standard error of measurement of a given score can serve as a reliable indication of real differences in applicants' academic knowledge and developed abilities.”

Translated to physics-ese:

**CONSIDER INSTRUMENT RESOLUTION**

S.E.M. ~60 points (on old GRE scale, 200-800).

740 = 800 = perfect!

Numerous departments report their average score for admission as 790, 800
Median of average GRE-Q scores Physics Depts reported to NRC: 760
From ETS document
"Factors that can influence performance on the GRE general test 2006-2007"

GRE Quantitative Scores (2006-2007)
Physical Sciences, US Citizens

- Asian Am.: N = 1474
- White: N = 14957
- Other Hispanic: N = 393
- Mexican Am.: N = 398
- Native Am.: N = 90
- African Am.: N = 1055
- Puerto Rican: N = 260
- Men: N = 12492
- Women: N = 7104

- 75%
- 25%
- 50%
These trends are:
- technically not “bias”
- qualitatively unchanged when controlling for undergraduate GPA
- qualitatively the same for the SAT
- reflected in race-based passing levels set by FL and VA for grade schoolers
- a feature of standardized testing?
Compiled from ETS document
"Factors that can influence performance on the GRE general test 2006-2007"

Median (NRC; Physics): 760

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Impact of Cut-off Scores?

• Make approximate score distributions from the ETS data
  – $25^{th}$, $50^{th}$, $75^{th}$, and sometimes $5^{th}$%
  – assume flat distribution between %’s
    • e.g., N/4 scores between $25^{th}$ and $50^{th}$

• Quantify (roughly) the impact of cut-off scores on representation

\[
\text{Representation} = \frac{\sum_{\text{one group}}}{\sum_{\text{all groups}}} \frac{800}{\text{Cut-off}} \frac{800}{\text{Cut-off}}
\]
Approximate Score Distributions

Only physical sciences & US citz.
# Impact of Cut-offs: Representation

<table>
<thead>
<tr>
<th>Cut-off</th>
<th>Asian Am.</th>
<th>White</th>
<th>URM</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>9.3%</td>
<td>81.5%</td>
<td>5.2%</td>
<td>26.8%</td>
<td>73.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Takers</th>
<th>Asian Am.</th>
<th>White</th>
<th>URM</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.6%</td>
<td>77.4%</td>
<td>11.2%</td>
<td>36.3%</td>
<td>63.7%</td>
</tr>
</tbody>
</table>

**Graphs:**
- **Left Graph:** Representation (%) vs. Cut-off for different groups.
  - **Legend:**
    - Women (red triangles)
    - Men (black circles)

- **Right Graph:** Representation (%) vs. Cut-off for different groups.
  - **Legend:**
    - Women (red triangles)
    - Men (black circles)
Impact of Cut-offs: 
%Δ Representation

 Representation

\[ \sum_{\text{one group}} \frac{800}{\text{Cut-off}} \]
\[ \sum_{\text{all groups}} \frac{800}{\text{Cut-off}} \]

Change of Representation (%)

Cut-off

Change of Representation (%)

Cut-off

Legend:
- Asian Am.
- White
- Afr. Am.
- Puerto Ric.
- Am. Ind.
- Hisp. (oth)
- Other
- Mex. Am.

250%

Men
Women
Ideas we are trying out:
Coarse-Grained Rubrics:

• Undergrad GPA
  – Trends in physics
• Undergrad Institution
• GRE scores
  – if relevant for predicting in your program
• Personal Statement
  – targeted topics?

• Recommendation Letters
  assign letter grades

• Call them!

A great resource: interview protocols and score sheet ideas
Correlating clinical performance to admissions criteria and noncognitive competencies

Provides empirical support (consistent with prior work) for correlations:
(a) YES: cognitive ability and didactic performance
(b) NO: cognitive ability and clinical performance
(c) YES: non-cognitive competencies and clinical performance
(d) Yes&No: non-cognitive competencies and didactic performance

Self-Management competencies correlate with clinical grade.
1. **Achievement Orientation**: Striving to improve, or meet a standard of excellence.
2. **Initiative**: Readiness to act on opportunities.
3. **Optimism**: Persistence in pursuing goals despite obstacles and setbacks.
4. **Adaptability**: Flexibility in handling change.
5. **Emotional Self-Control**: Keeping disruptive emotions and impulses in check.
6. **Trustworthiness**: Maintaining integrity.
7. **Conscientiousness**: Taking responsibility for personal performance.

“Cognitive ability and knowledge are threshold aspects of professional work, necessary **but not sufficient** for outstanding professional performance.”
Victoroff and Boyatzis, J. Dent. Ed 77, 416 (2013):

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“Cognitive ability and knowledge are threshold aspects of professional work, necessary but not sufficient for outstanding professional performance.”

These are measurable, and reportedly lack racial, gender, cultural, language performance differences.
Conclusions

Inappropriate use of GRE scores can have (has had??) a significant, unintended, adverse impact on diversity

<table>
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<td><strong>Cut-off</strong></td>
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<td>700</td>
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Programs should consider:
- developing safeguards against giving GRE scores undue weight,
- justifying present GRE usage: for you, does it predict success in research (the aim of the PhD)?