Hard Evidence on Soft Skills

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We live in an era of widespread testing.
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- Measure skills of persons (e.g., SAT, ACT, GRE, GED) and certify suitability for admission and qualifications in a variety of domains of life.
- To measure the performance of schools and entire national school systems and nations (e.g. PISA scores, NCLB)
These tests are not well understood.
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- What do they measure?
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- What do they measure?
- How are they validated? What do they predict?
These tests are not well understood.

a. What do they measure?
b. How are they validated? What do they predict?
c. What do they miss?
Achievement tests miss—or perhaps better—do not accurately capture—soft skills.
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Personality traits, goals, motivations, and preferences that are valuable in the labor market, in school, and in many other domains.
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Personality traits—“soft skills”—can be measured.

1. They are often as predictive of many life outcomes as are measures of cognition.
2. Personality traits have causal effects on behavioral outcomes: changing traits through interventions changes life outcomes.
Traits are stable across situations.
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Enhancing these traits is an important avenue for policy.
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Traits are stable across situations. Yet they can also be changed in a gradual way through investment and experience. Enhancing these traits is an important avenue for policy.

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There are “enduring traits” that persist and govern behavior across multiple domains of economic and social life.
I draw on recent research on the GED, an achievement test that secondary school dropouts in the U.S. can take to certify that they are the equivalents (in cognition) of high school graduates.
What Are the Lessons from This Research?

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- Personality—"character" broadly defined—can be measured.
- Personality can be fostered. It is an important, but neglected, component of what schools and families produce.
- A focus on achievement tests fostered by movements for "accountability" distorts the incentives of students and teachers.
A Brief History of Testing

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- Pioneers recognize their limits.
- They understood that schools produced more than simple “book learning” — academic knowledge — expressed frustration about how to measure it.
Early educators lacked a conceptual framework for thinking about what exactly should be measured.
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They lacked the technology for implementing such tests on a wide spread scale.
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Binet:

“[Success in school] . . . admits of other things than intelligence; to succeed in his studies, one must have qualities which depend on attention, will, and character; for example a certain docility, a regularity of habits, and especially continuity of effort. A child, even if intelligent, will learn little in class if he never listens, if he spends his time in playing tricks, in giggling, in playing truant.”

-Binet (1916, p. 254)
“What are the chief personality traits which, interacting with $g$, relate to individual differences in achievement and vocational success? The most universal personality trait is conscientiousness, that is, being responsible, dependable, caring, organized and persistent.”

-Jensen (1998, p. 575)
The modern conception of intelligence has moved well beyond “g” to a hierarchy of traits.
The modern conception of intelligence has moved well beyond “g” to a hierarchy of traits.

But “g” is still at the top of the hierarchy.
Figure: Modern View of “g”: An Hierarchical Scheme of General Intelligence and Its Components

Source: Recreated from Ackerman and Heggestad (1997), based on Carroll (1993).
Origins of the Modern Achievement Test

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- The distinction between knowledge and the ability to acquire it is clear.
- How one separates these concepts empirically is not so clear, especially since the ability to acquire knowledge is not a fixed trait but can be changed.
General Knowledge

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- Designed to be “objective”—not depend on teacher assessments as captured by grades. This was perceived to be a way to implement meritocratic notions of education.
- Iowa tests; ACT; GED; No Child Left Behind; NAEP; PISA tests are modern versions.
Iowa Test of Educational Development (ITED)

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- The prototype for all achievement tests.
- “Achievement” synonymous with “educational development.”
What matters most is not how many detailed facts a person can quote, but how well he can make use of what he knows, and how straight he can think about personal and group problems.

The Iowa Tests, therefore, were planned to measure the fundamental ideas the student has acquired permanently, and what he is able to do with them.

This seemed much more important than just measuring the specific information he had memorized in a course, which he would forget after the final exam.

They were planned to measure the real knowledge and reasoning ability a student had, no matter how he had acquired them . . .

-Lindquist (1948)
Achievement tests are designed to measure acquired knowledge.
• Achievement tests are designed to measure acquired knowledge.
• But what motivates students to acquire knowledge?
Achievement tests are designed to measure acquired knowledge.

But what motivates students to acquire knowledge?

Cognition, personality, as well as environmental determinants, such as parents, teachers, and peers.
What Do Schools Produce?

- Is it just the knowledge captured by standard achievement tests?
What Do Schools Produce?

- Is it just the knowledge captured by standard achievement tests?
- Every creator of an achievement test thought otherwise.
Mann:

“Hence to value schools, by length instead of quality, is a matchless absurdity. Arithmetic, grammar, and the other rudiments, as they are called, comprise but a small part of the teachings in a school. The rudiments of feeling are taught not less than the rudiments of thinking. The sentiments and passions get more lessons than the intellect. Though their open recitations may be less, their secret rehearsals are more.”

-Horace Mann (1867, p. 420)
“If the descriptions of educational development of individual students provided by tests are to be truly comprehensive, tests and measuring devices must be developed for many more educational objectives than are now not being measured at all. In general, satisfactory tests have thus far been developed only for objectives concerned with the student’s intellectual development, or with his purely rational behavior. Objectives concerned with his non-rational behavior, or with his emotional behavior, or objectives concerned with such things as artistic abilities, artistic and aesthetic values and tastes, moral values, attitudes toward social institutions and practices, habits relating to personal hygiene and physical fitness, managerial or executive ability, etc., have been seriously neglected in educational measurement.”

- Lindquist (1951, pp. 137-138)
"It should be emphasized ... that the General Educational Development [GED] Tests do not measure all the attributes that a high school attempts to develop in its students (character, attitude, interest, etc.). The Fact-Finding Study does not suggest that the high school level General Educational Development Tests are a substitute for a formal high school education."

- American Council on Education (1956, pp. 12)
Other mechanisms of assessment besides the objective exam were often suggested.
"We lean heavily on written examinations, on a few types of objective tests, and on the subjective impressions of teachers. Many other appraisal devices could be used, such as records of activities in which pupils participate, questionnaires, check lists, anecdotal records and observational records, interviews, reports made by parents, products made by the pupils, and records made by instruments (motion pictures, eye-movement records, sound recordings, and the like)."

-Tyler (1940)
But time and again, the achievement test won out as a cheap tool of assessment.
• But time and again, the achievement test won out as a cheap tool of assessment.
• Other methods were more costly, even if they missed a lot.
How are IQ and achievement tests validated?

- Usually on grades and other tests.
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- Usually on grades and other tests.
- This is ironic in light of the fact that the achievement test was invented in order to avoid the “subjectivity” of grades.
Table: Predictive Validities of Standard IQ and Achievement Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Domain over which it is validated</th>
<th>Estimated Validities</th>
<th>Source</th>
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</tr>
</thead>
<tbody>
<tr>
<td>SAT</td>
<td>First year college GPA</td>
<td>0.35 to 0.53</td>
<td>Kobrin et al. (2008)</td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>Grades in early years of college</td>
<td>0.42</td>
<td>ACT Incorporated (2007)</td>
<td></td>
</tr>
<tr>
<td>Stanford-Binet</td>
<td>Correlations with other intelligence tests</td>
<td>0.77 to 0.87 with WISC-R</td>
<td>Rothlisberg (1987); Greene et al. (1990)</td>
<td></td>
</tr>
<tr>
<td>WISC (Wechsler Intelligence Scale for Children)</td>
<td>Correlations with academic achievement</td>
<td>WISC: 0.443 to 0.751 with WRAT tests, 0.482 to 0.788 with 1st grade grades, 0.462 to 0.794 with 2nd grade grades; WISC-R: 0.346 to 0.760 with WRAT tests, 0.358 to 0.537 with 1st grade grades, 0.420 to 0.721 with 2nd grade grades</td>
<td>Hartlage and Steele (1977)</td>
<td>WRAT = Wide Range Achievement Test; ranges are given because correlations vary by academic subject</td>
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Source: Almund et al. (2011).
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<tr>
<td>WAIS (Wechsler Adult Intelligence Scale)</td>
<td>Correlations with other intelligence tests, achievement tests, and outcomes</td>
<td>0.67 (median) with verbal tests, 0.61 (median) with nonverbal tests, 0.69 with education attained, 0.38 to 0.43 with college grades, 0.62 with high school grades</td>
<td>Feingold (1982)</td>
<td></td>
</tr>
<tr>
<td>Raven's Standard Progressive Matrices</td>
<td>Correlations with other intelligence tests</td>
<td>0.74 to 0.84 with WAIS-R</td>
<td>O'Leary et al. (1991)</td>
<td></td>
</tr>
<tr>
<td>GATB (General Aptitude Test Battery)</td>
<td>Supervisor rating performance in training programs and in job performance</td>
<td>0.23 to 0.65</td>
<td>Hunter (1986)</td>
<td>Large range due to variety of jobs</td>
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<tr>
<td>ASVAB (Armed Services Vocational Aptitude Battery)</td>
<td>Performance in military training programs and military attrition rates</td>
<td>0.37 to 0.78 for training (mean=0.56); -0.15 for attrition</td>
<td>Schmidt et al. (1988) for performance in training programs; Sticht et al. (1982) for attrition rates</td>
<td>Large range in training correlations due to a variety of jobs</td>
</tr>
<tr>
<td>GED (General Educational Development)</td>
<td>Test difficulty is normed against graduating HS seniors. Test scores of high school seniors and grades of high school seniors</td>
<td>0.33 to 0.49 for HS Senior GPA</td>
<td>Technical Manual: 2002 Series GED Tests</td>
<td></td>
</tr>
<tr>
<td>Other Validity Studies of the GED</td>
<td>Correlation with other achievement tests</td>
<td>.75—.79 AFQT, .78 NALS, .81 Iowa Tests</td>
<td>Boesel et al. (1998)</td>
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<td>DAT (Differential Aptitude Tests)</td>
<td>Correlations with academic achievement</td>
<td>0.13 to 0.62 for college GPA</td>
<td>Omizo (1980)</td>
<td>Large range is due to varying validity of eight subtests of DAT</td>
</tr>
<tr>
<td>WIAT (Wechsler Individual Achievement Test)</td>
<td>Correlation with other achievement tests; teacher ratings of student achievement</td>
<td>0.80 with grade 4 CAT/2, 0.69 with grade 5 CAT/2, 0.83 with grade 6 CAT/2; 0.67 with teacher ratings</td>
<td>Michalko and Saklofske (1996)</td>
<td>CAT=California Achievement Test</td>
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Only recently has the validity of the tests on real world outcomes been established.
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They predict a bit, but they leave a lot unexplained.
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They predict a bit, but they leave a lot unexplained.

Achievement tests and grades are usually more predictive than IQ.
# Predictive Validities in Outcomes that Matter (Adjusted R-Squared)

<table>
<thead>
<tr>
<th></th>
<th>IQ</th>
<th>Pers</th>
<th>Both</th>
<th>AFQT</th>
<th>Pers</th>
<th>Both</th>
<th>GPA</th>
<th>Pers</th>
<th>Both</th>
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<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings at Age 35</td>
<td>0.07</td>
<td>0.05</td>
<td>0.09</td>
<td>0.17</td>
<td>0.07</td>
<td>0.18</td>
<td>0.09</td>
<td>0.06</td>
<td>0.12</td>
</tr>
<tr>
<td>Hourly Wage at Age 35</td>
<td>0.01</td>
<td>0.03</td>
<td>0.08</td>
<td>0.13</td>
<td>0.06</td>
<td>0.14</td>
<td>0.07</td>
<td>0.06</td>
<td>0.09</td>
</tr>
<tr>
<td>Hours Worked at Age 35</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.03</td>
<td>0.02</td>
<td>0.03</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Jail by Age 35</td>
<td>0.06</td>
<td>0.06</td>
<td>0.09</td>
<td>0.03</td>
<td>0.03</td>
<td>0.06</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
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<tr>
<td>Welfare at Age 35</td>
<td>0.04</td>
<td>0.04</td>
<td>0.06</td>
<td>0.01</td>
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<tr>
<td>Married at Age 35</td>
<td>0.12</td>
<td>0.08</td>
<td>0.16</td>
<td>0.19</td>
<td>0.10</td>
<td>0.22</td>
<td>0.14</td>
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<td>0.18</td>
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<tr>
<td>BA Degree by Age 35</td>
<td>0.12</td>
<td>0.08</td>
<td>0.16</td>
<td>0.04</td>
<td>0.04</td>
<td>0.06</td>
<td>0.02</td>
<td>0.04</td>
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</tr>
<tr>
<td>Depression in 1992</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
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<tr>
<td><strong>Adj, ( R^2 ) Cog, Personality</strong></td>
<td>0.07</td>
<td></td>
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<td>0.17</td>
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<td>0.11</td>
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<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.07</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Adj, ( R^2 ) Cog, Personality</strong></td>
<td>0.10</td>
<td></td>
<td></td>
<td>0.15</td>
<td></td>
<td></td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** National Longitudinal Survey of Youth 1979.
Personality

- Personality and Motivation: missing from IQ tests but predictive of adult performance.
**Personality**

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- Some of the missing dimensions manifest in these tables that explain a variety of educational and labor market outcomes.
Personality

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- These dimensions have begun to be systematically measured.
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- One popular measurement system: Big Five — OCEAN

O

Personality

C

Conserviousness

E

Extraversion

A

Agreeableness

N

Neuroticism
Personality

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  - Conscientiousness
  - Extraversion
  - Agreeableness
  - Neuroticism
### Table: The Big Five Domains and Their Facets

<table>
<thead>
<tr>
<th>Big Five Personality Factor</th>
<th>American Psychology Association Dictionary description</th>
<th>Facets (and correlated trait adjective)</th>
<th>Related Traits</th>
<th>Childhood Temperament Traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness to Experience</td>
<td>“the tendency to be open to new aesthetic, cultural, or intellectual experiences”</td>
<td>Fantasy (imaginative) Aesthetic (artistic) Feelings (excitable) Actions (wide interests) Ideas (curious) Values (unconventional)</td>
<td>Grit Perseverance Delay of gratification Impulse control Achievement striving Ambition Work ethic</td>
<td>Sensory sensitivity Pleasure in low-intensity activities Curiosity</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>“the tendency to be organized, responsible, and hardworking”</td>
<td>Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (ambitious) Self-discipline (not lazy) Deliberation (not impulsive)</td>
<td></td>
<td>Attention/(lack of) distractibility Effortful control Impulse control/delay of gratification Persistence Activity</td>
</tr>
</tbody>
</table>

Source: Table adapted from John and Srivastava (1999).
### Table: The Big Five Domains and Their Facets

<table>
<thead>
<tr>
<th>Domain</th>
<th>Facets</th>
<th>Source: Table adapted from John and Srivastava (1999).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraversion</td>
<td>“an orientation of one’s interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warmth (friendly)</td>
<td>Social dominance</td>
</tr>
<tr>
<td></td>
<td>Gregariousness (sociable)</td>
<td>Social vitality</td>
</tr>
<tr>
<td></td>
<td>Assertiveness (self-confident)</td>
<td>Sensation seeking</td>
</tr>
<tr>
<td></td>
<td>Activity (energetic)</td>
<td>Shyness*</td>
</tr>
<tr>
<td></td>
<td>Excitement seeking (adventurous)</td>
<td>Activity*</td>
</tr>
<tr>
<td></td>
<td>Positive emotions (enthusiastic)</td>
<td>Positive emotionality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sociability/affiliation</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>“the tendency to act in a cooperative, unselfish manner”</td>
<td>Irritability*</td>
</tr>
<tr>
<td></td>
<td>Trust (forgiving)</td>
<td>Aggressiveness</td>
</tr>
<tr>
<td></td>
<td>Straight-forwardness (not demanding)</td>
<td>Willfulness</td>
</tr>
<tr>
<td></td>
<td>Altruism (warm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance (not stubborn)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modesty (not show-off)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tender-mindedness (sympathetic)</td>
<td></td>
</tr>
<tr>
<td>Neuroticism/Emotional Stability</td>
<td>Emotional stability is “predictability and consistency in emotional reactions, with absence of rapid mood changes.” Neuroticism is “a chronic level of emotional instability and proneness to psychological distress.”</td>
<td>Fearfulness/behavioral inhibition</td>
</tr>
<tr>
<td></td>
<td>Anxiety (worrying)</td>
<td>Shyness*</td>
</tr>
<tr>
<td></td>
<td>Hostility (irritable)</td>
<td>Irritability*</td>
</tr>
<tr>
<td></td>
<td>Depression (not contented)</td>
<td>Frustration</td>
</tr>
<tr>
<td></td>
<td>Self-consciousness (shy)</td>
<td>(Lack of) soothability</td>
</tr>
<tr>
<td></td>
<td>Impulsiveness (moody)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vulnerability to stress (not self-confident)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Axis I psychopathologies (mental disorders) including depression and anxiety disorders</td>
</tr>
</tbody>
</table>

OCEAN

Source: Table adapted from John and Srivastava (1999).
Big Five is the most widely used system.
Big Five is the most widely used system.

Criticisms of Big Five
- Big Five is the most widely used system.

**Criticisms of Big Five**

- The five-factor model is atheoretical.
Big Five is the most widely used system.

Criticisms of Big Five

- The five-factor model is atheoretical.
- The five-factor model is relatively silent on an important class of individual differences: motivation and goals.
Defining non-cognitive traits for children

Childhood temperament is the term used by developmental psychologists to describe the personalities of infants and children.
Defining non-cognitive traits for children

- Childhood temperament is the term used by developmental psychologists to describe the personalities of infants and children.
- Most of the research on temperament has examined specific lower-order traits rather than broader, higher-level factors that characterize studies of adult intelligence and personality.
Validities for Personality Measures

What are the validities for personality tests?
Validities for Personality Measures

- What are the validities for personality tests?
- How correlated are measures with behaviors?
Validities for Personality Measures

- What are the validities for personality tests?
- How correlated are measures with behaviors?
- First consider the validities established by the creators of the personality measurement schemes.
### Table: Validities for Personality Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Domain of Validation</th>
<th>Estimated Validities</th>
<th>Source</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hogan Personality Inventory</td>
<td>Correlations with delinquency criterion; Factor correlations with outcomes</td>
<td>0.00 to 0.67 with School Success; 0.68 to 0.73 with Avoids Trouble; 0.22 to 0.33 with Non-experience Seeking; -0.44 to 0.01 with Enjoying Crowds; -0.42 to 0.09 with Exhibitionist; 0.25 to 0.43 with Easy to Live With; 0.36 to 0.44 with Good Sense of Attachment; 0.10 to 0.43 with Not Depressed; 0.26 to 0.54 with No Guilt; Delinquency factor correlates 0.91 with chargeable accidents; 0.80 with warning letters; 0.44 with suspensions; Absenteeism factor correlates 0.62 with grievances; 0.61 with absences; 0.55 with medical absences; 0.44 with workers compensation claims; Negative Sanctions factor correlates 0.68 with suspension letters; 0.67 with discharges; No Fault factor correlates 0.71 with nonchargeable accidents; Supervisor’s Ratings factor: 0.60 with supervisor’s ratings; 0.38 with health history</td>
<td>Hogan &amp; Hogan (1989)</td>
<td></td>
</tr>
<tr>
<td>Myers-Briggs Type Indicator</td>
<td>Correlations with other personality tests; agreement between reported personality type and best-fit personality type</td>
<td>Correlation with Big Five based on Adjective Check List: -0.70 (E-I to Extraversion); 0.44 (S-Thompson (2009) N to Openness); 0.47 (T-F to Agreeableness); 0.54 (J-P to Conscientiousness); 72.9% report same four preferences as best-fit type; 18.2% report same three out of four preferences as best-fit type</td>
<td>Schaubhut, Herk.</td>
<td></td>
</tr>
</tbody>
</table>
## Table: Validities for Personality Tests

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<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEO PI-R (Revised NEO Personality Inventory)</td>
<td>Correlations with other personality tests</td>
<td>Correlation with Positive Presentation Management Scale: -0.60 (N); 0.48 (E); 0.04 (O); 0.25 (A); 0.41 (C); correlations with Negative Presentation Management Scale: 0.39 (N); -0.46 (E); -0.31 (O); -0.38 (A); -0.54 (C); correlations with Big Five Index: 0.76 (E); 0.66 (A); 0.70 (C); -0.66 (N); 0.68 (O); correlations with Ten Item Personality Inventory: 0.65 (E); 0.59 (A); 0.68 (C); -0.66 (N); 0.56 (O)</td>
<td>Yang, Bagby. Ryder (2000); Gosling Rentfrow, Swann (2003)</td>
<td>N=neuroticism. E=extraversion. O=openness. A=agreeableness. C=conscientiousness</td>
</tr>
<tr>
<td>NEO-FFI (NEO Five Factor Inventory)</td>
<td>Correlations with other personality tests</td>
<td>0.73 overall with BFI (Big-Five Index)</td>
<td>Gosling, Rentfrow, Swann (2003)</td>
<td>Note: This is a shorter version of the NEO PI-R</td>
</tr>
<tr>
<td>Rotter Locus of Control</td>
<td>Correlation with high school GPA</td>
<td>Correlation with high school GPA is 0.09 in suburban schools. 0.26 in inner-city schools</td>
<td>Stipek &amp; Weisz (1981)</td>
<td></td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale</td>
<td>Correlations with other self-esteem scales</td>
<td>0.73 to 0.80 with Single Item Self-Esteem Scale; 0.15 to 0.76 with Harter’s Self-Perception Profile for Adolescents</td>
<td>Robins, Hendin, Trzniewski (2001); Hagborg (1993)</td>
<td>Correlations with Harter’s done on an item by item basis</td>
</tr>
<tr>
<td>Short GRIT Scale</td>
<td>Item-level correlations with outcomes</td>
<td>0.03 to 0.13 for West Point 2008 Retention. 0.00 to 0.11 for West Point 2010 Retention. 0.05 to 0.17 for Spelling Bee success. 0.03 to 0.32 for Ivy League GPA</td>
<td>Duckworth &amp; Quinn (2009)</td>
<td>Large ranges due to variety of items</td>
</tr>
</tbody>
</table>

Source: Almlund et al. 2011
How Predictive of Real World Behavior Are These Personality Traits?

- What do they predict?
How Predictive of Real World Behavior Are These Personality Traits?

- What do they predict?
- With what strength?
Figure: Association of the Big Five and intelligence with Years of Schooling

Source: Almlund et al. 2011
Figure: Correlations of The Big Five and Intelligence with High School Course Grades

Source: Almlund et al. 2011
Figure: Associations with Standardized Achievement Test Scores

Note: The values represent standardized regression coefficients when controlling for age at IQ test, gender, and ethnicity. IQ is measured using Raven’s Progressive Matrices. Source: Duckworth (2009)
Conscientiousness, however, may play a more pervasive role than IQ. The importance of IQ increases with job complexity, defined as the information processing requirements of the job: cognitive skills are more important for professors, scientists, and senior managers than for semi-skilled or unskilled laborers (Schmidt and Hunter [2004]). In contrast, the importance of Conscientiousness does not vary much with job complexity (Barrick and Mount [1991]), suggesting that it pertains to a wider spectrum of jobs. Causality remains an open question. The raw correlations presented in Figure 14 do not account for reverse-causality, and the authors do not clearly delineate when the measures of personality were taken.

Figure 14. Associations with Job Performance

Note. The values for personality are correlations that were corrected for sampling error, range restriction, and measurement error. Job performance was based on performance ratings, productivity data and training proficiency. The authors do report the timing of the measurements of personality relative to job performance. The value for IQ is a raw correlation.

Source(s): The values reported for personality traits come from a meta-analysis conducted by Barrick and Mount [1991]. The value for IQ and job performance was reported in Schmidt and Hunter [2004].
Figure: Correlations of Mortality with Personality, IQ, and Socioeconomic Status (SES)

Source: Almlund et al. 2011
Ever been in jail by age 30, by ability (males)

Ever been in jail by age 30, by ability (males)

Probability of being single with children (females)

Note: This figure plots the probability of a given behavior associated with moving up in one ability distribution for someone after integrating out the other distribution. For example, the lines with markers show the effect of increasing noncognitive ability after integrating the cognitive ability.

How Predictive of Success in Post-Secondary Education Are Achievement Tests Compared with Conscientiousness?
### Table: The Relative Predictive Power of Conscientiousness and SAT Scores for College GPA

<table>
<thead>
<tr>
<th>Source</th>
<th>Sample</th>
<th>Timing of Measurement and Outcome</th>
<th>Controls</th>
<th>Metric</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conard [2005]</td>
<td>University students in the US (N=186)</td>
<td>College GPA and SAT were both self-reported during college. Personality was measured in college.</td>
<td>Class Attendance</td>
<td>Standardized Regression Coefficient ($\beta$)</td>
<td>SAT Total Conscientiousness 0.27 0.30</td>
</tr>
<tr>
<td>Noftle and Robins [2007]</td>
<td>University students in the US (N=10,497)</td>
<td>College GPA and SAT were both self-reported during college. Personality was measured in college.</td>
<td>Gender, Other Big Five Traits</td>
<td>Standardized Regression Coefficient ($\beta$)</td>
<td>SAT Verbal Conscientiousness 0.19 0.24</td>
</tr>
<tr>
<td>Wolfe and Johnson [1995]</td>
<td>University students in the US (N=201)</td>
<td>GPA and SAT were provided by the Colleges' Record Office. Personality was measured in college.</td>
<td>High School GPA</td>
<td>Standardized Regression Coefficient ($\beta$)</td>
<td>SAT Total Conscientiousness 0.23 0.31</td>
</tr>
</tbody>
</table>
What Do Grades and Scores on Achievement Tests Measure?

- How are the scores on tests and grades determined?
IQ ("g_f")

Acquired Knowledge ("g_c")

Personality

Incentives

Grades and Achievement Test Scores
**Figure:** Decomposing Achievement Tests and Grades into IQ and Personality [NLSY79]

![Graph showing R-squared values for Achievement and Grades.](image)

Source: Borghans, Golsteyn, Heckman et al. [2011].
**Figure:** Decomposing Achievement Tests and Grades into IQ and Personality [Stella Maris]

Source: Borghans, Golsteyn, Heckman et al. [2011].
This explains in part the greater predictive power of achievement tests and grades compared to IQ in explaining real world outcomes.
### Predictive Validities in Outcomes that Matter (Adjusted R-Squared)

<table>
<thead>
<tr>
<th>Males</th>
<th>IQ</th>
<th>Pers Both</th>
<th>AFQT</th>
<th>Pers Both</th>
<th>GPA</th>
<th>Pers Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earnings at Age 35</td>
<td>0.07</td>
<td>0.05</td>
<td>0.09</td>
<td>0.17</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Hourly Wage at Age 35</td>
<td>0.07</td>
<td>0.03</td>
<td>0.08</td>
<td>0.13</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Hours Worked at Age 35</td>
<td>0.01</td>
<td>0.03</td>
<td>0.04</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Jail by Age 35</td>
<td>0.03</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Welfare at Age 35</td>
<td>0.01</td>
<td>0.00</td>
<td>0.01</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Married at Age 35</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>BA Degree by Age 35</td>
<td>0.12</td>
<td>0.08</td>
<td>0.16</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Depression in 1992</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Adj, R² Cog, Personality**

0.07 | 0.17 | 0.11

<table>
<thead>
<tr>
<th>Females</th>
<th>IQ</th>
<th>Pers Both</th>
<th>AFQT</th>
<th>Pers Both</th>
<th>GPA</th>
<th>Pers Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earnings at Age 35</td>
<td>0.01</td>
<td>0.03</td>
<td>0.03</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Hourly Wage at Age 35</td>
<td>0.05</td>
<td>0.03</td>
<td>0.06</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Hours Worked at Age 35</td>
<td>-0.00</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Jail by Age 35</td>
<td>-0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Welfare at Age 35</td>
<td>0.02</td>
<td>0.04</td>
<td>0.05</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Married at Age 35</td>
<td>0.03</td>
<td>0.03</td>
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<td>0.05</td>
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<tr>
<td></td>
<td>BA Degree by Age 35</td>
<td>0.10</td>
<td>0.08</td>
<td>0.14</td>
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<td>0.09</td>
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<td>Depression in 1992</td>
<td>0.02</td>
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<td>0.05</td>
</tr>
</tbody>
</table>

**Adj, R² Cog, Personality**

0.10 | 0.15 | 0.10

**Source:** National Longitudinal Survey of Youth 1979.
Causality:

- Establishing causality is essential in designing policy and interpreting evidence.
Causality:

- Establishing causality is essential in designing policy and interpreting evidence.
- Correlation is not the same as causation, although a lot of public policy is based only on correlations.
Causality:

- Establishing causality is essential in designing policy and interpreting evidence.
- Correlation is not the same as causation, although a lot of public policy is based only on correlations.
- The doctors in Russia.
Questions

- Are any of the predictive relationships between personality and cognition and outcomes causal?
Questions

- Are any of the predictive relationships between personality and cognition and outcomes causal?
- Can we change cognition and personality and affect outcomes?
Questions

- Are any of the predictive relationships between personality and cognition and outcomes causal?
- Can we change cognition and personality and affect outcomes?
- Are they fixed traits?
Questions

- Are any of the predictive relationships between personality and cognition and outcomes causal?
- Can we change cognition and personality and affect outcomes?
- Are they fixed traits?
- Is promoting cognition and personality a useful policy option?
Questions

- Are any of the predictive relationships between personality and cognition and outcomes causal?
- Can we change cognition and personality and affect outcomes?
- Are they fixed traits?
- Is promoting cognition and personality a useful policy option?
- What do we miss by ignoring soft skills?
Difficulties in Establishing Causality

- Reverse causality
  \[ A \iff B \]
Difficulties in Establishing Causality

- Reverse causality
  \[(A \iff B)\]
- Measured traits can be caused in part by the outcomes being studied.
Correlation vs. Causality

A is correlated with B
What is causal?

A ➔ B
Correlation vs. Causality
A is correlated with B
What is causal?

A ⟷ B
B ⟷ A
Correlation vs. Causality
A is correlated with B
What is causal?

A ➔ ? ➔ B

B ➔ ? ➔ A

A ← ? ← B

Heckman

Hard Evidence on Soft Skills
Correlation vs. Causality
A is correlated with B
What is causal?

A → B

B → A

A → B

C → A

C → B
Correlation vs. Causality

A is correlated with B

What is causal?

\[ A \rightarrow B \]
\[ B \rightarrow A \]
\[ A \leftarrow B \]
\[ C \rightarrow B \]
\[ C \rightarrow A \]

Heckman

Hard Evidence on Soft Skills
Correlation vs. Causality
A is correlated with B
What is causal?

Heckman
Hard Evidence on Soft Skills
Correlation vs. Causality
A is correlated with B
What is causal?

A \overset{?}{\rightarrow} B

B \overset{?}{\rightarrow} A

A \leftarrow \overset{?}{\rightarrow} B

C \overset{?}{\rightarrow} B

A \leftarrow \overset{?}{\rightarrow} B

C \leftarrow \overset{?}{\rightarrow} A

C \leftarrow \overset{?}{\rightarrow} B

C \leftarrow \overset{?}{\rightarrow} A

Heckman

Hard Evidence on Soft Skills
All psychological measurements are calibrated on task performances.
• All psychological measurements are calibrated on task performances.

• A fundamental interpretive problem lies at the heart of any psychological measurement system for any particular trait.
All psychological measurements are calibrated on task performances.

A fundamental interpretive problem lies at the heart of any psychological measurement system for any particular trait.

For these traits to be accurate measures of any particular trait or set of traits, it is necessary to standardize for incentives and the effects of other traits in performing a task.
All psychological measurements are calibrated on task performances.

A fundamental interpretive problem lies at the heart of any psychological measurement system for any particular trait.

For these traits to be accurate measures of any particular trait or set of traits, it is necessary to standardize for incentives and the effects of other traits in performing a task.

Examples: Incentivizing IQ tests.
- All psychological measurements are calibrated on task performances.
- A fundamental interpretive problem lies at the heart of any psychological measurement system for any particular trait. For these traits to be accurate measures of any particular trait or set of traits, it is necessary to standardize for incentives and the effects of other traits in performing a task.
- Examples: Incentivizing IQ tests.
- Can boost IQ by 15 points by giving candies for correct answers — the Black/White gap in IQ in U.S.
### Table: Incentives and Performance on Intelligence Tests

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample and Study Design</th>
<th>Experimental Group</th>
<th>Effect size of incentive (in standard deviations)</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edlund [1972]</td>
<td>Between subjects study. 11 matched pairs of low SES children; children were about one standard deviation below average in IQ at baseline</td>
<td>M&amp;M candies given for each right answer</td>
<td>Experimental group scored 12 points higher than control group during a second testing on an alternative form of the Stanford Binet (about 0.8 standard deviations)</td>
<td>“…a carefully chosen consequence, candy, given contingent on each occurrence of correct responses to an IQ test, can result in a significantly higher IQ score.” (p. 319)</td>
</tr>
<tr>
<td>Breuning and Zella [1978]</td>
<td>Within and between subjects study of 485 <em>special education</em> high school students all took IQ tests, then were randomly assigned to control or incentive groups to retake tests. Subjects were below-average in IQ.</td>
<td>Incentives such as record albums, radios (&lt;$25) given for improvement in test performance</td>
<td>Scores increased by about 17 points. Results were consistent across the Otis-Lennon, WISC-R, and Lorge-Thorndike tests.</td>
<td>“In summary, the promise of individualized incentives contingent on an increase in IQ test performance (as compared with pretest performance) resulted in an approximate 17-point increase in IQ test scores. These increases were equally spread across subtests… The incentive condition effects were much less pronounced for students having pretest IQs between 98 and 120 and did not occur for students having pretest IQs between 121 and 140.” (p. 225)</td>
</tr>
</tbody>
</table>

- Many other studies (see ADHK).
Responsiveness to Incentives on IQ and Achievement Tests
Depends on Personality

Segal (2006) shows that introducing performance-based cash incentives in a low-stakes administration of a measure of IQ increases performance substantially among roughly one-third of participants.
Responsiveness to Incentives on IQ and Achievement Tests Depends on Personality

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- Less conscientious people are particularly affected by incentives.
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Less conscientious people are particularly affected by incentives.

Borghans, Meijers and ter Weel (2006) show that adults spend substantially more time answering IQ questions when rewards are higher, but subjects high in emotional stability and conscientiousness are much less affected by these incentives.
Personality traits affect IQ scores indirectly through the knowledge acquired by individuals who are more open to experience, more curious and more perseverant.
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There is a correlation between cognitive and non-cognitive factors.
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IQ test performance reflects not only pure intelligence, but also intrinsic motivation, anxiety, knowledge, and reactions to extrinsic incentives to perform well.
IQ ("g_f")

Knowledge ("g_c")

Personality

Effort

Task Performance
IQ ("g_f")

Knowledge ("g_c")

Personality

Effort

Task Performance

Heckman

Hard Evidence on Soft Skills
IQ ("g_f")

Knowledge ("g_c")

Personality

Effort

Task Performance
Causal Evidence on the Power of Personality

- Present causal evidence on the power of soft skills in producing life outcomes.
Causal Evidence on the Power of Personality

- Present causal evidence on the power of soft skills in producing life outcomes.
- Evidence that soft skills can be fostered.
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- Sources of Evidence
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Sources of Evidence

i. The GED Program
ii. Perry Intervention
iii. Causal Effect of Schooling on Test Scores
The GED as a case study of the power of soft skills and costs of neglecting them

- Draw in part on a forthcoming book.
The GED as a case study of the power of soft skills and costs of neglecting them

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- GED is a group of 5 achievement tests normed against national samples of high school graduates (70% can pass).
The GED as a case study of the power of soft skills and costs of neglecting them

- Draw in part on a forthcoming book.
- GED is an achievement test that secondary school dropouts can take to certify that they are the equivalents of ordinary secondary school graduates.
- GED is a group of 5 achievement tests normed against national samples of high school graduates (70% can pass).
- 12% of all secondary school certificates issued in the U.S. are given to GEDs.
Use multiple data sets on outcomes, backgrounds, and abilities for all major economic and social groups in the U.S over multiple periods.
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- GEDs are as smart as secondary school graduates who do not go on to college.
- Use multiple data sets on outcomes, backgrounds, and abilities for all major economic and social groups in the U.S over multiple periods.

- GEDs are as smart as secondary school graduates who do not go on to college.

- GEDs who go on to college and succeed are indistinguishable from other college graduates in terms of annual wage income (True for AA and BA students).
However, terminal GEDs perform at a level closer to that of dropouts.
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Identical to dropouts if we control for their greater cognitive ability.
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We examine what essential life skills GEDs lack.
• However, terminal GEDs perform at a level closer to that of dropouts.
• Identical to dropouts if we control for their greater cognitive ability.
• We examine what essential life skills GEDs lack.
• Comparing GEDs to Dropouts standardizes ability (as measured by achievement tests) and demonstrates the importance of personality traits in predicting life outcomes.
**Figure:** Cognitive ability by educational status (no college sample, all ethnic groups)

Source: Heckman, Humphries, Urzua, and Veramendi (2010)
Figure: Cognitive ability by educational status (no college sample, all ethnic groups)

Source: Heckman, Humphries, Urzua, and Veramendi (2010)
GEDs lack noncognitive — personality — traits measured in many ways: behaviors and personality test scores.
Sources: National Longitudinal Survey of Youth 1979, National Educational Longitudinal Survey. Notes: Rosenberg is a ten measure self-confidence scale administered in 1980. Rotter is a 4 (two part) measure of locus of control. Locus of control is a measure of how much control an individual believes they have over their life. The Self Concept measure included in NELS measures evaluates the respondents sense of self-worth or self-confidence.
Risky Behaviors (Males)

(a) Sex and Smoking
(b) Minor Crime and Drinking
(c) Major Crimes
(d) Violent Behaviors

Risky Behaviors (Females)

(a) Sex and Smoking

(b) Minor Crime and Drinking

(c) Major Crimes

(d) Violent Behaviors

**Figure:** Distribution of Non-Cognitive Skills by Education Group

Gaps in achievement and personality deficits emerge early.
**Figure**: Early Cognitive and Noncognitive Tests

(a) PIAT, Males
(b) PIAT, Females
(c) BPI, Males
(d) BPI, Females

Source: Moon (2012), Children of the National Longitudinal Survey of Youth 1979 (CNLSY). **Notes**: The Peabody Individual Achievement Test (PIAT) is a widely used childhood achievement test. The PIAT score is normalized to have mean zero and variance one across the entire population. The Behavioral Problems Index (BPI) is based on a 28 question survey given to parents about their child. The BPI is normalized to have mean zero and variance one across the entire population.
The early childhood environments of both dropouts and GEDs are worse than those of H.S. Grads. (Moon, 2011; Cunha et al., 2010)
**Figure: Broken Home Rates**

(a) Broken Home, Males
(b) Broken Home, Females

**Sources:** National Longitudinal Survey of Youth 1979 (NLSY79) Longitudinal Survey of Youth 1997 (NLSY97), National Educational Longitudinal Survey (NELS). Variables Definitions: Broken Home Rates are defined as percent of children who don’t live with their two biological parents.
**Figure: Investment During Childhood**

(a) Parental Investment (CNLSY), Males

(b) Parental Investment (CNLSY), Females

Sources: Children of the National Longitudinal Survey of Youth (CNLSY). Variables Definitions: Childhood Investment Measured by material resources (child's access to books, toys, CD or tape player, musical instruments, and books or magazines at home), cognitive stimulation investments (how often the children are read to, taught lessons, brought to cultural events, and characteristics of the home environment) and emotional support investments (verbal and physical interactions with child, disciplinary behavior, and responsibility of child for household chores).
Traits Predict Many Outcomes

- These traits are highly predictive of who graduates from secondary school and who does not.
Traits Predict Many Outcomes

- These traits are highly predictive of who graduates from secondary school and who does not.
- Noncognitive traits do not predict GED certification.
**Figure:** Probability of Graduating from Secondary School (by cognitive and non-cognitive skill decile)

Source: Reproduced from Heckman et al. (2011).
Figure: Probability of GED Certification (conditional on dropping out, by cognitive and non-cognitive decile)

Source: Reproduced from Heckman et al. (2011).
GED certificate holders attempt postsecondary education.
• GED certificate holders attempt postsecondary education.
• Few succeed.
GED certificate holders attempt postsecondary education.
Few succeed.
This is a recurrent pattern.
GED certificate holders attempt postsecondary education.
Few succeed.
This is a recurrent pattern.
GEDs tend to drop out of everything they start (school, marriage, jobs, military).
Figure: Final Educational Attainment by High School Exit Status

Males

Figure: Final Educational Attainment by High School Exit Status

Females

If a GED gets a BA or a MA, he/she earns at that level.
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However, there is usually delay and this has substantial costs.
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However, there is usually delay and this has substantial costs.
The present value of earnings for such people is substantially (20–30%) lower than if they had not dropped out of school.
But GEDs who do not complete a further certificate or degree earn at the rate of dropouts for people with comparable schooling attained (at the dropout stage) and ability.
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No benefit for males.
But GEDs who do not complete a further certificate or degree earn at the rate of dropouts for people with comparable schooling attained (at the dropout stage) and ability.

No benefit for males.

This is robust across a variety of specifications.
Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Annual Earnings Across Models for Males

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Hourly Wage Across Models for Males

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Employment Across Models for Males

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Hours Worked Across Models for Males

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Labor Force Participation Given Labor Force Participation for Males

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Unemployment Given Labor Force Participation for Males

Women

- The early literature focused on males.
Women

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- Simplifies the analysis: avoids statistical problems associated with selection into the labor force as an empirical issue. (Many women not working, and wages are missing for them.)
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- But misses an important empirical phenomenon.
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- **There are GED effects for certain groups of females.**
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- **There are GED effects for certain groups of females.**
- But only for employment and earnings, not hourly wage rates, or for hours of work of the employed.
Women

- The early literature focused on males.
- Simplifies the analysis: avoids statistical problems associated with selection into the labor force as an empirical issue. (Many women not working, and wages are missing for them.)
- But misses an important empirical phenomenon.
- **There are GED effects for certain groups of females.**
- But only for employment and earnings, not hourly wage rates, or for hours of work of the employed.
- Unclear if its a causal effect or just a signalling effect.
Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Annual Earnings Across Models for Females

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Hourly Wage Across Models for Females

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Employment Across Models for Females

Estimated Distribution, Employment

p-value Distribution, Employment

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Hours Worked Across Models for Females

Distribution of the Estimated Effect of the GED Certificate and High School Graduation on Labor Force Participation Given Labor Force Participation for Females

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Why Do Some Women Benefit?

- Two groups of women benefit.
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- Bright girls who drop out of school early (pregnancy) but were successful in school compared to other dropouts—they GED certify late after their children enroll in primary school.
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- They work hard, do not invest much on the job, have little wage growth.
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- Bright girls who drop out of school early (pregnancy) but were successful in school compared to other dropouts—they GED certify late after their children enroll in primary school.
- They work hard, do not invest much on the job, have little wage growth.
- A second group is bright girls who had problems in high school, dropped out and go to and graduate from college.
We have no direct measures of personality post-pregnancy, but we have evidence on their behaviors.
- We have no direct measures of personality post-pregnancy, but we have evidence on their behaviors.
- They are persistent in the workplace after they re-enter.
Longitudinal analysis supports the cross section analysis.
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- Using a variety of procedures, employment gains for women.
- Longitudinal analysis supports the cross section analysis.
- Using a variety of procedures, employment gains for women.
- No hourly wage gains — no evidence of investment.
Can People Change?

Stability of Traits

- Are traits stable? Can people change?
Can People Change?

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- The evidence for women suggests this might be a possibility.
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- But as a group, post-GED turnover behavior is quite stable.
Can People Change?

Stability of Traits

- Are traits stable? Can people change?
- The evidence for women suggests this might be a possibility.
- But as a group, post-GED turnover behavior is quite stable.
- High quit rates for all who start (school; marriage; job; military).
Survival Rate in Employment (All Races, All Levels of Post-Secondary Education)

In Employment, Males

Source: National Longitudinal Survey of Youth 1979 (NLSY79), nationally representative cross sectional sample.
Survival Rate in Employment (All Races, All Levels of Post-Secondary Education)

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Survival Rate in Employment (All Races, All Levels of Post-Secondary Education)

Source: National Longitudinal Survey of Youth 1979 (NLSY79), nationally representative cross sectional sample.
Survival Rate in Marriage (All Races, All Levels of Post-Secondary Education)

Source: National Longitudinal Survey of Youth 1979 (NLSY79), nationally representative cross sectional sample.
Survival Rate in Marriage (All Races, All Levels of Post-Secondary Education)

In Marriage, Females

Source: National Longitudinal Survey of Youth 1979 (NLSY79), nationally representative cross sectional sample.
Survival Rate Not Incarcerated (All Races, All Levels of Post-Secondary Education)

In Non–Incarcerated State, Males

Source: National Longitudinal Survey of Youth 1979 (NLSY79), nationally representative cross sectional sample.
Are Personality Traits Ephemeral?

- Claim: People adapt fully to situations.
Are Personality Traits Ephemeral?

- Claim: People adapt fully to situations.
- No such thing as a stable trait.
The modern origins of the situational specificity hypothesis is based on the work of the social psychologist Walter Mischel:

“...with the possible exception of intelligence, highly generalized behavioral consistencies have not been demonstrated, and the concept of personality traits as broad dispositions is thus untenable”

-Mischel (1968, p. 146)
Many behavioral economists hold a similar view and appeal to Mischel as a guiding influence.

“The great contribution to psychology by Walter Mischel […] is to show that there is no such thing as a stable personality trait.”

- Thaler (2008)
The stability of traits found for GEDs challenges the situational specificity hypothesis current in behavioral economics.

- The evidence from the GED and much other evidence speaks strongly against the claims of Mischel and the behavioral economists. (See Almlund et al., 2011.)

There is irony in Mischel's claim for he is most famous for his research on the marshmallow test. His work shows stability of traits over 20 years.
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There is irony in Mischel’s claim for he is most famous for his research on the marshmallow test.

His work shows stability of traits over 20 years.
Stability and Change in Personality Traits and Preferences

- Traits change over the life cycle.
**Figure:** Cumulative Mean-Level Changes in Personality Across the Life Cycle

**Social Vitality (Extraversion)**

Note: Social vitality and social dominance are aspects of Big Five Extraversion. Cumulative d values represent total lifetime change in units of standard deviations ("effect sizes").

Source: Figure taken from Roberts, Walton and Viechtbauer [2006] and Roberts and Mroczek [2008]. Reprinted with permission of the authors.
Figure: Cumulative Mean-Level Changes in Personality Across the Life Cycle

Social Dominance

Note: Social vitality and social dominance are aspects of Big Five Extraversion. Cumulative \( d \) values represent total lifetime change in units of standard deviations (“effect sizes”).

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Three Processes of Development Discussed in the Literature on Personality and Cognition

- Ontogeny (programmed developmental processes common to all persons) and sociogeny (shared socialization processes).
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- Ontogeny (programmed developmental processes common to all persons) and sociogeny (shared socialization processes).
- Personality changes through external forces above and beyond common ontogenic and sociogenic processes that operate through alterations in normal biology, such as brain lesions and chemical interventions. (Phineas Gage is the most celebrated example.)
Three Processes of Development Discussed in the Literature on Personality and Cognition

- Ontogeny (programmed developmental processes common to all persons) and sociogeny (shared socialization processes).

- Personality changes through external forces above and beyond common ontogenic and sociogenic processes that operate through alterations in normal biology, such as brain lesions and chemical interventions. (Phineas Gage is the most celebrated example.)

- Investment: educational interventions and parental investment can affect personality throughout the lifecycle.
Ontogenic Processes
Figure: Proportion of Individuals in Each Age Group Scoring at or Above the Mean for 26- to 30-Year-Olds on Indices of Intellectual and Psychosocial Maturity.

Source: From Steinberg, Cauffman, Woolard et al. (2009), submitted for publication.
These developmental processes suggest that giving secondary school students the option to drop out and take a GED will lead to decisions they may later regret.
Investment
Schooling boosts cognitive and noncognitive traits.
Schooling boosts cognitive and noncognitive traits.
The effect is causal.
Schooling boosts cognitive and noncognitive traits.

The effect is causal.

This is in agreement with common sense and all of the claims by leading educators over the years.
Figure: Causal Effect of Schooling on Measures on Cognition (from ASVAB)

Source: Heckman et al. (2006).
Figure: Causal Effect of Schooling on Measures on Cognition (from ASVAB)

Source: Heckman et al. (2006).
Figure: Causal Effect of Schooling on Two Measures of Socioemotional Skills

Source: Heckman et al. (2006).
**Figure:** Causal Effect of Schooling on Two Measures of Socioemotional Skills

Source: Heckman et al. (2006).
Additional Causal Evidence on the Power of Noncognitive Traits and Evidence that They Can Be Boosted by Investment

Perry Preschool Study

- Early childhood intervention
Additional Causal Evidence on the Power of Noncognitive Traits and Evidence that They Can Be Boosted by Investment

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- Early childhood intervention
- Perry had lasting effects on life outcomes for both boys and girls.

(Heckman et al., 2010)
Additional Causal Evidence on the Power of Noncognitive Traits and Evidence that They Can Be Boosted by Investment

Perry Preschool Study

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- With a 7–10% annual rate of return for both (Heckman et al., 2010)
Additional Causal Evidence on the Power of Noncognitive Traits and Evidence that They Can Be Boosted by Investment

Perry Preschool Study

- Early childhood intervention
- Perry had lasting effects on life outcomes for both boys and girls.
- With a 7–10% annual rate of return for both (Heckman et al., 2010)
- Did not boost IQ
Figure: Cognitive Evolution Through Time, Perry Males: Male Cognitive Dynamics
Boosted Achievement Test Scores
**Figure:** Perry Age 14 Total CAT Scores, by Treatment Group

CAT = California Achievement Test
Treatment: N = 49; Control: N = 46
Statistically Significant Effect for Males and Females (p-values 0.009, 0.021 respectively)
But we have already seen that a substantial component of the variability in achievement test scores is due to variability in personality traits.
But we have already seen that a substantial component of the variability in achievement test scores is due to variability in personality traits.

- **Perry Boosted Measured Noncognitive Traits**
**Figure:** Personal Behavior Index, by Treatment Group

- **Control**
  - Density vs. Behavior Index
- **Treatment**
  - Density vs. Behavior Index
Figure: Socio-Emotional Index by Treatment Group

Control

Treatment
**Figure: Decomposition of Treatment Effects**

- CAT total*, age 14 (+)
- Employed, age 19 (+)
- Monthly Income, age 27 (+)
- No tobacco use, age 27 (+)
- # of adult arrests, age 27 (-)
- Jobless for more than 2 years, age 40 (-)
- Ever on welfare (-)
- Total charges of viol.crimes with victim costs, age 40, (-)
- Total charges of all crimes, age 40 (-)
- Total # of lifetime arrests, age 40 (-)
- Total # of adult arrests, age 40 (-)
- Total # of misdemeanor arrests, age 40 (-)
- Total charges of all crimes with victim costs, age 40 (-)
- Any charges of a crime with victim cost, age 40 (-)

Figure: Decomposition of Treatment Effects

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Figure: Decomposition of Treatment Effects


Heckman

Hard Evidence on Soft Skills
Figure: Decomposition of Treatment Effects

**Figure: Decomposition of Treatment Effects**

<table>
<thead>
<tr>
<th>Category</th>
<th>Cognitive Factors</th>
<th>Socio-Emotional State</th>
<th>Personal Behavior</th>
<th>Other Factors</th>
</tr>
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<td># of adult arrests, age 27 (-)</td>
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<tr>
<td>Jobless for more than 2 years, age 40 (-)</td>
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<td>Ever on welfare (-)</td>
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<td>Total charges of viol.crimes with victim costs, age 40, (-)</td>
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<tr>
<td>Total charges of all crimes, age 40 (-)</td>
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<td>Total # of lifetime arrests, age 40 (-)</td>
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<tr>
<td>Total # of adult arrests, age 40 (-)</td>
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<tr>
<td>Total # of misdemeanor arrests, age 40 (-)</td>
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<tr>
<td>Total charges of all crimes with victim costs, age 40 (-)</td>
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<tr>
<td>Any charges of a crime with victim cost, age 40 (-)</td>
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</tbody>
</table>

The Dynamics of Life Cycle Investment
Gaps in cognitive and noncognitive skills open up early across social and economic groups.
Gaps in cognitive and noncognitive skills open up early across social and economic groups.

For both cognitive and socioemotional traits, ability gaps across socioeconomic groups open up at early ages and persist.
Figure: Trend in mean cognitive score by maternal education

Each score standardized within observed sample. Using all observations and assuming data missing at random. Source: Brooks-Gunn et al. (2006).
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Figure: Average percentile rank on anti-social behavior score, by income quartile

(The higher the score, the worse are behavioral problems)
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• The early origins of gaps in cognitive and noncognitive skills may suggest a genetic basis.

• Cognitive and noncognitive traits are **not** determined solely by genetics but genetics plays a role.

• 50% of variance in the traits is heritable.

• Family investment and early childhood programs promote both cognitive and noncognitive skills.
IQ can be fostered in the very early years (0-3).
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• IQ becomes rank stable by the early teenage years.
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- Achievement (crystallized intelligence or knowledge) can be acquired throughout one's lifetime but not raw "fluid" intelligence.

Personality skills are more malleable until later ages. Schools and early family environments (parenting practices) serve to shape these skills.
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- Prenatal Parental Environments
- Parental Prenatal Investment
- Fetal Traits
- Childhood traits (personality, cognition, and health)
- Investment: Parenting and Preschool
- Perinatal Parental Environments
**Figure:** A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation

- **Prenatal Parental Environments**
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- **Investment: Parenting and Preschool**

**PRENATAL**

**BIRTH**
Figure: A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation

- Prenatal Parental Environments
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- Fetal Traits
- Childhood traits (personality, cognition, and health)
- Traits
- Parenting and Preschool
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- PRENATAL
- BIRTH
- EARLY CHILDHOOD 0-3

Heckman

Hard Evidence on Soft Skills
Figure: A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation
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- Prenatal Parental Environments
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- Traits

Legend:
- PRENATAL
- BIRTH
- EARLY CHILDHOOD 0-3
Figure: A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation

- Prenatal Parental Environments
- Parental Prenatal Investment
- Fetal Traits
- Childhood traits (personality, cognition, and health)
- Parenting and Preschool
- Traits

- Prenatal
- Birth
- Early Childhood (0-3)
Figure: A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation
**Figure: A Life Cycle Framework for Organizing Studies and Integrating Evidence: The Technology of Skill Formation**

- **Prenatal Parental Environments** → **Parental Prenatal Investment** → **Fetal Traits**
- **Perinatal Parental Environments** → **Investment: Parenting and Preschool** → **Childhood traits (personality, cognition, and health)**
- **Parental Environments** → **Parenting and Preschool** → **Traits**
- **Traits**

**PRENATAL**

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**EARLY CHILDHOOD 0-3**

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- Parental Environments
- Parenting and Preschool
- Parental Environments
- Parenting and School
- Traits
-_traits

PRENATAL
BIRTH
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Prenatal Parental Environments

Parental Prenatal Investment

Fetal Traits

Perinatal Parental Environments

Investment: Parenting and Preschool

Childhood traits (personality, cognition, and health)

Prenatal Parental Environments

Parental Environments

Parenting and Preschool

Parenting and School

Adult Traits

Traits

EARLY CHILDHOOD 0-3

LATER CHILDHOOD 3-6

ADULTHOOD
Figure: Synergies among Investment and Traits

- Cognition (early) → Cognition (later)
- Personality (early) → Personality (later)
- Investment (early) → Investment (later)
Figure: Synergies among Investment and Traits

Cognition (early) → Cognition (later)

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Cognition (early)  ➔  Cognition (later)
Personality (early)  ➔  Personality (later)
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Cognition (early) ► Cognition (later)

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Heckman - Hard Evidence on Soft Skills
Cunha, Heckman and Schennach [2010] estimate these relationships using longitudinal data on the development of children with rich measures of parental investment and child traits.
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Persistence of traits becomes stronger as children become older, for both cognitive and noncognitive capabilities.
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Persistence of traits becomes stronger as children become older, for both cognitive and noncognitive capabilities.

It is more difficult to compensate for the effects of adverse environments on cognitive endowments at later ages than it is at earlier ages.
Explains a large body of evidence on ineffective cognitive remediation strategies for disadvantaged adolescents.
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• Overall, 16% of the variation in educational attainment is explained by factors extracted from cognitive traits, 12% is due to factors extracted from personality traits, and 15% is due to factors extracted from measured parental investments.
Prioritizing Investment

- Fluidity and malleability of traits while people are young.
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- Fluidity and malleability of traits while people are young.
- Difficulty in changing traits in older adults.
- Society should invest relatively more in the early years.
- Builds the skill base that makes later-age investment more productive.
- Avoids costly and usually ineffective late adolescent and adult remediation.
Figure: Returns to a unit Real invested

Programs targeted towards the earliest years
Figure: Returns to a unit Real invested

Programs targeted towards the earliest years

Preschool programs
Figure: Returns to a unit Real invested
Figure: Returns to a unit Real invested

- Programs targeted towards the earliest years
- Preschool programs
- Schooling
- Job training

RATE OF RETURN TO INVESTMENT IN HUMAN CAPITAL

AGE

0-3  4-5  School  Post-school
Yet society invests relatively more in the later years.
• Yet society invests relatively more in the later years.
• Brasil used to be very imbalanced in supporting investment in the later ages and for the advantaged.
Yet society invests relatively more in the later years.

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It still has a long way to go.
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It still has a long way to go.

A shift in educational investment towards early ages and a recognition of the powerful role of noncognitive skills will be a more effective educational policy.
Costs of Neglecting Soft Skills: Lessons from the GED Testing Program in the U.S.

- Induces Dropping Out
Costs of Neglecting Soft Skills: Lessons from the GED Testing Program in the U.S.

- Induces Dropping Out
- Deceptive Statistics
Induces Dropping Out

- Immature decision makers tempted by bad choices (Steinberg, 2009).
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  (a) Slowly developing prefrontal cortex.
Induces Dropping Out

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  - (b) Youth need guidance.
Induces Dropping Out

- Immature decision makers tempted by bad choices (Steinberg, 2009).
  - (a) Slowly developing prefrontal cortex.
  - (b) Youth need guidance.
  - (c) Giving them a GED option distorts lifetime choices.
Figure: Proportion of Individuals in Each Age Group Scoring at or Above the Mean for 26- to 30-Year-Olds on Indices of Intellectual and Psychosocial Maturity.

Source: From Steinberg, Cauffman, Woolard et al. (2009), submitted for publication.
 Costs of dropout and delay:

(a) Delay in attainment: 10% loss in present value for each year of delay; delay is 2–3 years for those who attain the degree.
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(b) Loss of skills acquired in high school from seat time.
Summary

1. Personality traits can be measured and have predictive power on par with cognitive traits.
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Summary

1. Personality traits can be measured and have predictive power on par with cognitive traits.
2. There is a growing body of evidence that shows the causal status of these traits—not just a correlation.
3. Both cognitive and personality traits can be enhanced by policy.
4. Cognitive traits less malleable after ages 10–12.
5. Personality traits are more malleable until later ages and are an avenue of policy through the young adult years.
There is a dynamic to capability formation: capabilities cross foster each other and are self-productive.
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Heckman

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Early intervention more cost effective than later life remediation.

There are real costs to society of ignoring soft skills—
  a produces perverse incentives for children and teachers;
  b produces distorted statistics.
Appendix
<table>
<thead>
<tr>
<th>Psychology Term</th>
<th>Definition (American Psychological Association 2007 Dictionary definition in quotes)</th>
<th>Example Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affect</td>
<td>“Any experience of feeling or emotion, ranging from suffering to elation, from the simplest to the most complex sensations of feeling, and from the most normal to the most pathological emotional reactions.”</td>
<td>Positive and Negative Affect Scale (PANAS; (Watson, Clark, &amp; Tellegen, 1988))</td>
</tr>
<tr>
<td>Big Five Agreeableness</td>
<td>“The tendency to act in a cooperative, unselfish manner, construed as one end of a dimension of individual differences (agreeableness vs. disagreeableness) in the Big Five personality model.”</td>
<td>Agreeableness domain of any Big Five questionnaire.</td>
</tr>
<tr>
<td>Big Five Conscientiousness</td>
<td>“The tendency to be organized, responsible, and hardworking, construed as one end of a dimension of individual differences (conscientiousness vs. lack of direction) in the Big Five personality model.”</td>
<td>Conscientiousness domain of any Big Five questionnaire</td>
</tr>
<tr>
<td>Big Five Extraversion</td>
<td>“An orientation of one’s interests and energies toward the outer world of people and things rather than the inner world of subjective experience. Extraversion is a broad personality trait and, like introversion, exists on a continuum of attitudes and behaviors. Extroverts are relatively more outgoing, gregarious, sociable, and openly expressive.”</td>
<td>Extraversion domain of any Big Five questionnaire.</td>
</tr>
<tr>
<td>Big Five Neuroticism (or Emotional Stability)</td>
<td>“One of the dimensions of the…Big Five personality model characterized by a chronic level of emotional instability and proneness to psychological distress.”</td>
<td>Neuroticism domain of any Big Five questionnaire.</td>
</tr>
<tr>
<td>Big Five Openness to Experience (or Intellect)</td>
<td>“A dimension of the Big Five personality model that refers to individual differences in the tendency to be open to new aesthetic, cultural, or intellectual experiences.”</td>
<td>Openness domain of any Big Five questionnaire; Typical Intellectual Engagement (Goff &amp; Ackerman, 1992)</td>
</tr>
<tr>
<td>Big Five personality model</td>
<td>“A model of the primary dimensions of individual differences in personality. The dimensions are usually labeled extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience, though the labels vary somewhat among researchers.”</td>
<td>NEO-PI-R (Costa &amp; McCrae, 1992); Big Five Inventory (John &amp; Srivastava, 1999)</td>
</tr>
<tr>
<td>Cognitive reflection</td>
<td>A specific mental ability. The tendency to reflect before taking an intuitive answer as correct.</td>
<td>Cognitive Reflection Test (Frederick, 2005)</td>
</tr>
<tr>
<td>Creativity</td>
<td>“Ability to produce original work, theories, techniques or thoughts […] Related with imagination, expressiveness, originality.”</td>
<td>Creative Personality Scale (Gough, 1979)</td>
</tr>
<tr>
<td>Delay of gratification</td>
<td>“Forgoing immediate reward in order to obtain a larger or more desirable reward in the future”</td>
<td>Preschool Delay of Gratification Task (Mischel &amp; Metzner, 1962); Choice Delay task (Duckworth &amp; Seligman, 2005)</td>
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<tr>
<td><strong>Glossary of Psychology Terms (Continued)</strong></td>
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<tr>
<td><strong>Emotional Intelligence</strong></td>
<td>“Ability to process emotional information and use it in reasoning and other cognitive activities. According to Mayer and Salovey 1997 model it comprises four abilities: to perceive and appraise emotions accurately, to access and evoke emotions when they facilitate cognition, to comprehend emotional language and make use of emotional information, and to regulate one’s own and others’ emotions to promote growth and well-being”</td>
<td>MSCEIT (Mayer, Salovey, &amp; Caruso, 2002)</td>
</tr>
<tr>
<td><strong>Executive Function</strong></td>
<td>“Higher level cognitive processes that organize and order behavior, including logic and reasoning, abstract thinking, problem solving, planning and carrying out and terminating goal-directed behavior” Executive function generally refers to the broad array of functions attributed to the frontal cortex; some psychologists include general intelligence in this array whereas others do not.</td>
<td>Innumerable neuropsychology tasks (e.g., go/no-go, Stroop, Continuous Performance Task); BRIEF rating scale (Donders, 2002)</td>
</tr>
<tr>
<td><strong>Goals and Motives</strong></td>
<td>Goal: “The end state toward which a human is striving” Motive: “Physiological or psychological state of arousal that directs an organism’s energies toward a goal”</td>
<td>Thematic Apperception Test (McClelland, Atkinson, Clark, &amp; Lowell, 1976; McClelland &amp; Koestner, 1992); Jackson Personality Research Form (Jackson, 1974)</td>
</tr>
<tr>
<td><strong>Intelligence, g, IQ</strong></td>
<td>Intelligence: “The ability to derive information, learn from experience, adapt to the environment, understand and correctly utilize thought and reason. There are many different definitions of intelligence, including an operational one, proposed by Edwin Boring, that intelligence is what is tested by intelligence tests. There is currently much debate, as there has been in the past, over the exact nature of intelligence.” Intelligence is used by most psychologists synonymously with cognitive ability and mental ability. g or general factor: “A hypothetical source of individual differences in general ability, which represents individuals’ abilities to perceive relationships and to derive conclusions from them. The general factor is said to be a basic ability that underlies the performance of different varieties of intellectual tasks, in contrast to specific abilities, which are alleged each to be unique to a single task. Even theorists who posit multiple mental abilities have often suggested that a general factor may underlie these (correlated) mental abilities”</td>
<td>Weschler Intelligence Scale for Children (WISC), Weschler Adult Intelligence Scale (WAIS), Raven Progressive Matrices</td>
</tr>
<tr>
<td>Interests</td>
<td>“Attitude characterized by a need to give selective attention to something that is significant to the individual”.</td>
<td>Self-Directed Search (<a href="http://www.self-directed-search.com/Holland.html">http://www.self-directed-search.com/Holland.html</a>), Strong Interest Inventory (<a href="http://www.cpp.com/products/strong/index.asp">http://www.cpp.com/products/strong/index.asp</a>)</td>
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<tr>
<td>Locus of control</td>
<td>“Perception of how much control individuals have over conditions of their lives”.</td>
<td>Internal-External Locus of Control Scale (Rotter, 1966)</td>
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<tr>
<td>Myers-Briggs Type Indicator (MBTI)</td>
<td>“A personality test designed to classify individuals according to their expressed choices between contrasting alternatives in certain categories of traits. The categories, based on Jungian typology, are extraversion-Introversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving…The test has little credibility among research psychologists but is widely used in educational counseling and human resource management…”</td>
<td>MBTI (<a href="http://www.cpp.com/products/mbti/index.asp">http://www.cpp.com/products/mbti/index.asp</a>)</td>
</tr>
<tr>
<td>Psychopathology</td>
<td>“Patterns of behavior or thought processes that are abnormal or maladaptive”. A broad category comprising dysfunctional patterns of thought, feeling, or behavior. Most disorders are included in the Diagnostic and Statistical Manual of Mental Disorders (DSM) manual published by the American Psychiatric Association. Axis I disorders (e.g., depression) are more intense and episodic/discreet, whereas Axis II disorders (i.e., personality disorders) are more tonic and enduring.</td>
<td>Beck Depression Inventory; Beck Anxiety Inventory; Minnesota Multiphasic Personality Inventory (omnibus measure of multiple disorders); Child Behavior Checklist</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>“An individual’s capacity to act effectively to bring about desired results, especially as perceived by the individual.”</td>
<td>Generalized self-efficacy scales¹. Children's Perceived Self-Efficacy Scales (Pastorelli et al., 2001).</td>
</tr>
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<td>Self-esteem</td>
<td>“The degree to which the qualities and characteristics contained in one’s self concept are perceived to be positive”</td>
<td>Rosenberg Self-Esteem Scale (Rosenberg, 1989)</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>“The tendency to search out and engage in thrilling activities as a method of increasing stimulation and arousal. It takes the form of engaging in highly stimulating activities accompanied by a perception of danger.” A facet of either Big Five Conscientiousness or Extraversion</td>
<td>Sensation-Seeking Scale (M. Zuckerman, 1974; Marvin Zuckerman, 2006)</td>
</tr>
<tr>
<td>Social dominance</td>
<td>A dimension of Big Five Extraversion that includes facets such as dominance, independent, and self-confidence, especially in social settings.</td>
<td>NEO-PI-R Assertiveness scale; 16PF Dominance Scale</td>
</tr>
<tr>
<td>Specific mental abilities</td>
<td>“Abilities as measured by tests of an individual in areas of spatial visualization, perceptual need, number facility, verbal comprehension, word fluency, memory, inductive reasoning and so forth”</td>
<td>Subtest scores on IQ tests</td>
</tr>
</tbody>
</table>

¹ Bandura, originator of the concept "self-efficacy" emphasizes the importance of measuring domain-specific measures (Bandura, 1999).
<table>
<thead>
<tr>
<th><strong>Social vitality</strong></th>
<th>A dimension of Big Five Extraversion that includes traits such as sociability, positive effect, and gregariousness.</th>
<th>California Personality Inventory (CPI) Sociability Scale; NEO-PI-R Gregariousness and Activity Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperament (childhood)</strong></td>
<td>“Basic foundation of personality, usually assumed to be biologically determined and present early in life [...] includes characteristics such as energy level, emotional responsiveness, response tempo and willingness to explore”</td>
<td>Children's Behavior Questionnaire (<a href="http://www.bowdoin.edu/~sputnam/rothbart-temperament-questionnaires/">http://www.bowdoin.edu/~sputnam/rothbart-temperament-questionnaires/</a>)</td>
</tr>
<tr>
<td><strong>Type A/Type B personality</strong></td>
<td>Type A personality is “a personality pattern characterized by chronic competitiveness, high levels of achievement motivation, and hostility.” Type B personality is “a personality pattern characterized by low levels of competitiveness and frustration and a relaxed, easy going approach.”</td>
<td>Jenkins Activity Survey (Jenkins, Zyzanski, &amp; Rosenman, 1971)</td>
</tr>
<tr>
<td><strong>Values</strong></td>
<td>“A moral, social or aesthetic principle accepted by an individual (or society) as a guide to what is good, desirable or important.”</td>
<td>Values in Action Inventory of Strengths (Peterson &amp; Seligman, 2004)</td>
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Alternative measurement systems and their communalities
### Competing taxonomies of personality

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<tr>
<th>Neuroticism</th>
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Note: Figure reproduced from Bouchard and Loehlin (2001). Figure used with permission of the publisher.
### Competing Taxonomies of Personality (cont.)

<table>
<thead>
<tr>
<th>Psychotism (cont.)</th>
<th>Conscientiousness</th>
<th>Constraint</th>
<th>Zuckerman</th>
<th>Cloninger</th>
<th>Big Nine</th>
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<td>Control</td>
<td>Impulsive Sensation Seeking</td>
<td>Self-Directedness</td>
<td>Dependability</td>
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<td>Dutifulness</td>
<td>Traditionalism</td>
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<td>Self-discipline</td>
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<td>Reward Dependence</td>
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<td>Well-being</td>
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</tbody>
</table>

| Extraversion       | Extraversion      | Harm avoidance | Impulsive Sensation Seeking | Novelty Seeking | |
|--------------------|-------------------|----------------|--------------------------------|-----------------|
| Sensation-seeking  | Excitement seeking| Activity       |                               |                 |
| Venturesome        |                   |                |                               |                 |
| Active             |                   |                |                               |                 |
| Surgent            |                   |                |                               |                 |
| Carefree           |                   |                |                               |                 |
|                    | Sociable          |                |                               |                 |
|                    | Lively            |                |                               |                 |
|                    | Assertive         |                |                               |                 |
|                    | Dominant          |                |                               |                 |

<table>
<thead>
<tr>
<th>Positive emotionality</th>
<th>Achievement</th>
<th>Social Closeness</th>
<th>Sociability</th>
<th>Affiliation</th>
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<td>Positive emotions</td>
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## Competing taxonomies of personality (cont.)

<table>
<thead>
<tr>
<th>Evsenck</th>
<th>Costa &amp; McCrae</th>
<th>Tellegen</th>
<th>Zuckerman</th>
<th>Cloninger</th>
<th>Big Nine</th>
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<tbody>
<tr>
<td>Big Three</td>
<td>NEO-PRF Big Five</td>
<td>MPQ</td>
<td></td>
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</tr>
</tbody>
</table>

**Openness**
- Fantasy
- Aesthetics
- Feelings
- Actions
- Ideas
- Values

**Absorption**

**Self-Transcendence**

Note: Figure reproduced from Bouchard and Loehlin (2001). Figure used with permission of the publisher.
Labor Market Outcomes - Ages 20-39 - (Males, All Levels of Post-Secondary Education)

Labor Market Outcomes - Ages 20-39 - (Males, All Levels of Post-Secondary Education)

(c) Hours Worked

(d) Employment

Labor Market Outcomes - Ages 20-39 - (Males, All Levels of Post-Secondary Education)

Labor Market Differences - Ages 20-39 - (Females, All Levels of Post-Secondary Education)

(a) Annual Earnings

(b) Hourly Wage

Labor Market Differences - Ages 20-39 - (Females, All Levels of Post-Secondary Education)

(c) Hours Worked

(d) Employment

Labor Market Differences - Ages 20-39 - (Females, All Levels of Post-Secondary Education)

**Figure:** Average Occupational Factor Scores by Final Education - Males

**Source:** The American Community Survey 2009 and O-Net. **Notes:** All educational categories are final education at time of interview. Each factor is based on the following O-Net occupational importance scores: *Cognitive* - active learning, analytical thinking, complex problem solving, critical thinking, deductive reasoning, inductive reasoning, interpretation of meaning, math reasoning, mathematics, processing information, reading comprehension, creative thinking, updating knowledge and visualization. *Social* - communicate to outside organizations, concern for others, customer or personal service, establish relationships, leadership, oral expression, persuasion, social perceptiveness, speaking, writing, written expression, active listening, and cooperation. *Physical Traits* - arm and hand steadiness, control and precision, coordination, depth perception, explosive strength, finger dexterity, gross body coordination, gross body equilibrium, manual dexterity, multi-limb coordination, reaction time, spatial orientation, stamina, static strength, stress tolerance, trunk strength, and wrist and finger speed.

---

**Figure:**

A line graph showing the average occupational factor scores by final education level for males. The x-axis represents different educational levels: Dropout, GED, High School Graduate, Some College, AA, and BA. The y-axis ranges from -1 to 1, representing the factor scores.

- **Cognitive Traits** are represented by black triangles.
- **Social Traits** are represented by gray circles.
- **Physical Traits** are represented by black squares.

The graph indicates a trend where cognitive traits decrease from Dropout to BA, while social and physical traits increase from Dropout to BA.

---

**Source:** The American Community Survey 2009 and O-Net. **Notes:** All educational categories are final education at time of interview. Each factor is based on the following O-Net occupational importance scores: *Cognitive* - active learning, analytical thinking, complex problem solving, critical thinking, deductive reasoning, inductive reasoning, interpretation of meaning, math reasoning, mathematics, processing information, reading comprehension, creative thinking, updating knowledge and visualization. *Social* - communicate to outside organizations, concern for others, customer or personal service, establish relationships, leadership, oral expression, persuasion, social perceptiveness, speaking, writing, written expression, active listening, and cooperation. *Physical Traits* - arm and hand steadiness, control and precision, coordination, depth perception, explosive strength, finger dexterity, gross body coordination, gross body equilibrium, manual dexterity, multi-limb coordination, reaction time, spatial orientation, stamina, static strength, stress tolerance, trunk strength, and wrist and finger speed.
**Figure:** Average Occupational Factor Scores by Final Education - Females

Source: The American Community Survey 2009 and O-Net. Notes: All educational categories are final education at time of interview. Each factor is based on the following O-Net occupational importance scores: Cognitive - active learning, analytical thinking, complex problem solving, critical thinking, deductive reasoning, inductive reasoning, interpretation of meaning, math reasoning, mathematics, processing information, reading comprehension, creative thinking, updating knowledge and visualization. Social - communicate to outside organizations, concern for others, customer or personal service, establish relationships, leadership, oral expression, persuasion, social perceptiveness, speaking, writing, written expression, active listening, and cooperation. Physical Traits - arm and hand steadiness, control and precision, coordination, depth perception, explosive strength, finger dexterity, gross body coordination, gross body equilibrium, manual dexterity, multi-limb coordination, reaction time, spatial orientation, stamina, static strength, stress tolerance, trunk strength, and wrist and finger speed.
The GED Induces Students to Drop Out

- Loss of skills acquired in high school.
The GED Induces Students to Drop Out

- Loss of skills acquired in high school.
- Delay in attaining a BA even for those who get it.
Figure: Graduation Rate Before and After Implementing the GED Program, California vs. All other States

Notes: Authors' calculations based on NCES data. The graduation rate is the number of regular public and private high school diplomas issued over the 14 year old population four years previous. Population totals for the U.S. were obtained from the U.S. Census Bureau. California population estimates were obtained from the California Demographic Research Unit. Huber-White robust standard errors in parentheses. State 15 year old population are used as weights. Pre-period is defined as 1971-1973 and Post-period as 1975-1977.
Distorts Statistics

- On Secondary School Dropout Rate
### Inflates the High School Graduation Rate

**Effects of the GED on the Measured High School Graduation Rate**

<table>
<thead>
<tr>
<th>Panel</th>
<th>All Races</th>
<th>Whites</th>
<th>Blacks</th>
<th>Hispanics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A. Overall</strong></td>
<td>-7.4%</td>
<td>-7.5%</td>
<td>-9.5%</td>
<td>-5.7%</td>
</tr>
<tr>
<td><strong>Panel B. Males</strong></td>
<td>-8.1%</td>
<td>-8.7%</td>
<td>-10.3%</td>
<td>-5.0%</td>
</tr>
<tr>
<td><strong>Panel C. Females</strong></td>
<td>-6.6%</td>
<td>-6.3%</td>
<td>-8.7%</td>
<td>-6.5%</td>
</tr>
</tbody>
</table>

Notes: Authors' calculations based on Census 2000 data (IPUMS). All estimates are weighted and race categories are mutually exclusive. Calculations are for the 20-24 year old population. Total GED recipients are estimated from GED testing service data. The recent immigrant category contains only those who are in the civilian non-institutional population and who emigrated to the U.S. after 1990. Those still enrolled in high school are excluded from calculations. The percentage of GEDs who are recent immigrants is estimated from CPS October data. Estimates of GEDs who are incarcerated or in the military are obtained from BJS and DOD data, respectively. The bias calculations are computed sequentially so that those belonging to multiple groups are only counted once. The order of the categories excluded matches the column order in each table.

Source: Heckman and LaFontaine (2010).
## Overall U.S. Graduation Rate by Race, Census IPUMS 1970-2000

<table>
<thead>
<tr>
<th></th>
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<tr>
<td><strong>Panel A. Males and Females</strong></td>
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<td>58.6%</td>
<td>56.3%</td>
<td>58.5%</td>
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Note: Authors’ calculations from Census 1970, 1980, 1990 and 2000 data. Census graduation rates are ages 20-24 or 25-29 depending on cohort and do not include recent immigrants. Recent immigrants are those who entered the U.S. within the last ten years for 20-24 year olds and within the last fifteen years for 25-29 year olds. GED recipients are estimated for each cohort using GEDTS data and are deducted from the Census high school completer totals. 1981-1985 estimates from 2004 ACS data. Those who report never having enrolled in school are excluded. All races calculations include Asians, Native Americans and other race groups not shown separately.

Source: Heckman and LaFontaine (2010).
Distorts Statistics on Wage Differentials
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<tr>
<th></th>
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<th>Weekly Wage</th>
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<tr>
<td>Growth in College-HS Gap</td>
<td>18.40</td>
<td>12.82</td>
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<td>(8.26)</td>
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<tr>
<td>Growth in College-Dropout Gap</td>
<td>23.67</td>
<td>13.60</td>
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<tr>
<td></td>
<td>(27.30)</td>
<td>(23.23)</td>
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</table>

Source: Heckman and LaFontaine (2010).