

A Rosetta Stone for Noncognitive Skills

Understanding, Assessing, and Enhancing Noncognitive Skills in
Primary and Secondary Education

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THE BIG FIVE FACTORS

Table 1: Terms describing key noncognitive skills

Assertiveness	Adaptability	Cheerfulness	Collaboration
Collegiality	Communications	Confidence	Coping with Stress
Creativity	Cultural Competence	Curiosity	Dependability
Determination	Effortful Control	Enthusiasm	Entrepreneurialism
Ethical Behavior	Fairness	Friendliness	Generosity
Grit	Growth Mindset	Honesty	Imagination
Innovation	Integrity	Kindness	Leadership
Liveliness	Moderation	Optimism	Organization
Patience	Persistence	Planning	Professionalism
Punctuality	Resilience	Responsibility	Self-Consciousness
Self-Esteem	Self-Regulation	Sociability	Teamwork
Time Management	Tolerance	Trustworthiness	Work Ethic

A ROSETTA STONE FOR NONCOGNITIVE SKILLS

- The Big Five factors, were not “invented” per se (by researchers combing society, the economy, and citizenship to determine which traits are most important, and then determining how they might be best labeled and differentiated);
- Rather they were in effect “discovered.”
- Allport and Odbert (1936) searched Webster’s New International Dictionary from 1925 for English words that described human characteristics.
- In total, 18,000 English words were selected, with 4,500 being classified as descriptions of stable personal traits.
- Cattell (1943) applied factor analytic procedures to reduce the massive list of traits by analyzing the underlying patterns among them.
- He then studied personality data from different sources (e.g., interpersonal ratings, objective measures of daily behavior, and questionnaire results), and measured these traits in diverse populations to arrive at 16 major personality factors (Cattell, 1957, 1973).

Figure 1: Map of the globe showing where measurements of the Big Five model of personality have been applied and replicated (green = compelling evidence; yellow = suggestive evidence; white = inconclusive replication studies).

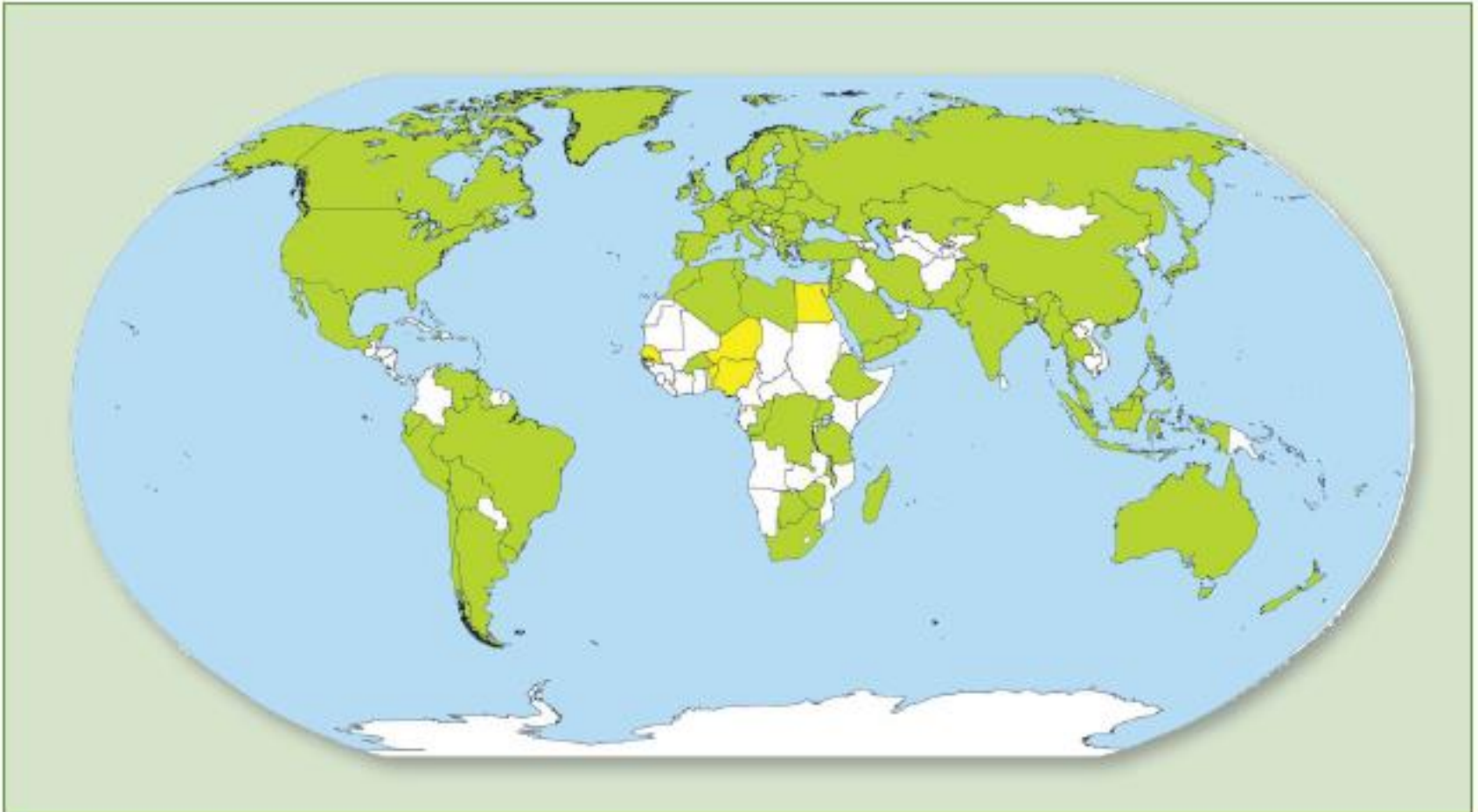
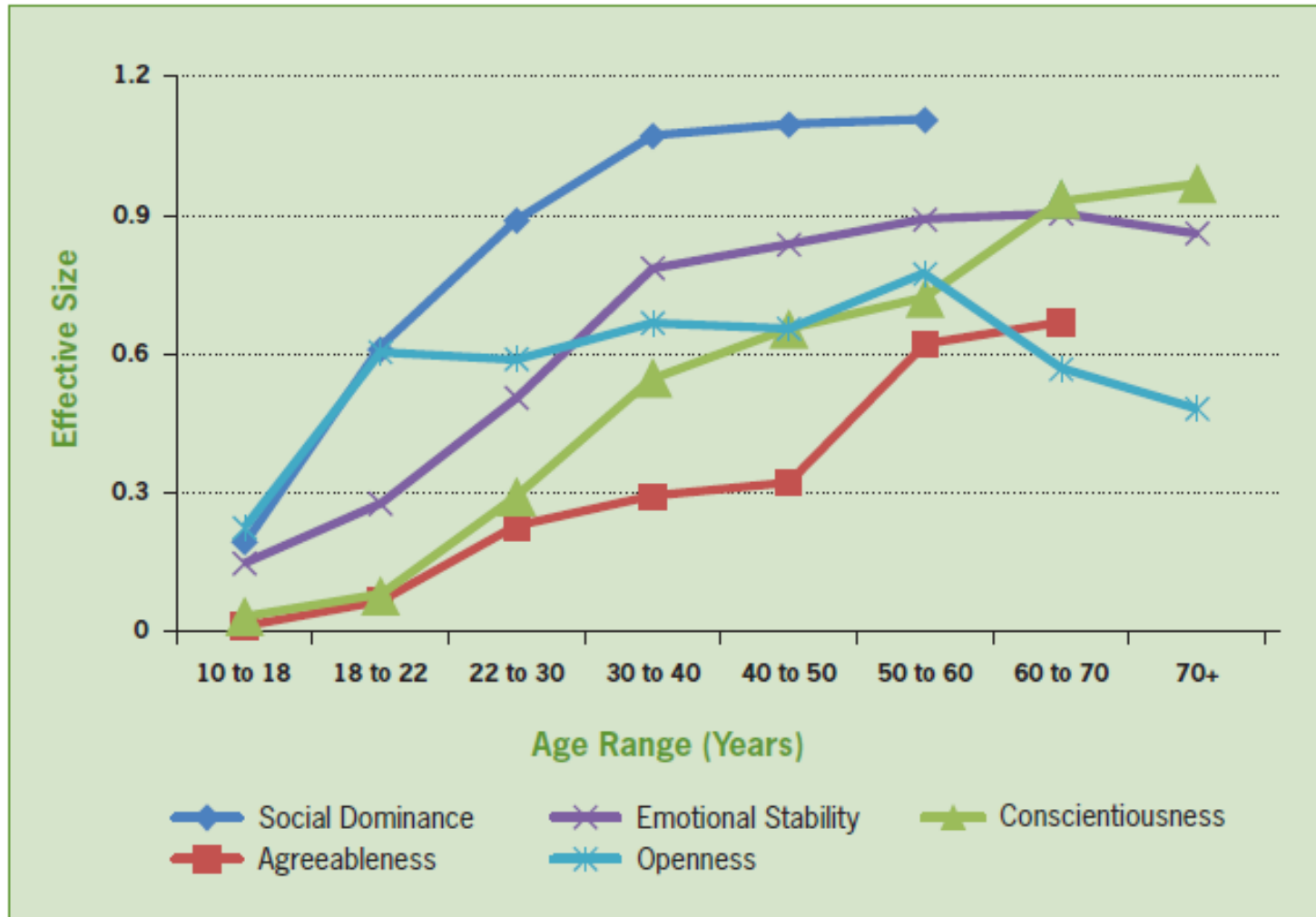


Table 2: Terms describing key noncognitive skills realigned by the Big Five factors

Conscientiousness	Agreeableness	Emotional Stability	Openness	Extraversion
Dependability	Collaboration	Confidence	Creativity	Assertiveness
Grit	Collegiality	Coping with Stress	Curiosity	Cheerfulness
Organization	Generosity	Moderation	Global Awareness	Communication
Persistence	Honesty	Resilience	Growth Mindset	Friendliness
Planning	Integrity	Self-Consciousness	Imagination	Leadership
Punctuality	Kindness	Self-Esteem	Innovation	Liveliness
Responsibility	Trustworthiness	Self-Regulation	Tolerance	Sociability

- The Big Five can therefore be considered as something of a Rosetta Stone for understanding noncognitive skills and their typology.
- Using the Big Five factors, we can take concepts expressed as time management in one list, grit in another, and responsibility in still a third, and understand their connectedness by seeing them all as manifestations of Conscientiousness, at least in significant measure.

Figure 2: Meta-analytic evidence showing that personality does change over a lifespan



RELEVANCE FOR EDUCATION SYSTEMS

Table 3: Correlation of the Big Five and cognitive ability with grade point average in primary, secondary, and tertiary educational sectors as determined by a meta-analysis of over 70,000 students

	Educational Level		
	Primary	Secondary	Tertiary
Conscientiousness	.28	.21	.23
Agreeableness	.30	.05	.06
Emotional Stability	.20	.01	-.01
Openness	.24	.12	.07
Extraversion	.18	-.01	-.03
Cognitive Ability	.58	.24	.23

Intervention Studies

- Summarizing the results of over seventy-five studies, and especially those afterschool programs where social and emotional skills are inculcated, Durlak, Weissberg, and Pachan (2010) note that these non-formal learning programs had an overall positive and statistically significant impact on the youth who participated.
- These changes did not occur in all domains, but rather in three main areas: feelings and attitudes, indicators of behavioral adjustment, and school performance.
- In particular, there were significant increases in youths' self-perceptions, bonding to school, positive social behaviors, school grades, and achievement test scores.
- Significant reductions also appeared for problem-related behaviors.
- In addition, certain programs that used a protocol focused on sequenced, active, focused, and explicit programming (that the authors describe at length) were associated with practical gains in participants' test scores of 12 percentile points between the afterschool and control group, a result that is similar to, or better than, those obtained by many other evidence-based interventions for school-aged populations.

RELEVANCE FOR WORKFORCE SYSTEMS

- Consider the United States Department of Labor's Occupational Information Network (O*Net), which provides occupational definitions to help job seekers and businesses, and the human resource specialists who are pivotal in staffing these businesses, understand the world of work.

Table 4: The relative importance of Big Five facets and factors to 23 job families representing approximately 1,102 occupations in O*Net (Big Five factors are in brackets)

Job Family	O*NET Worker Style Characteristic		
	Top Ranked	Second Ranked	Third Ranked
Architecture and Engineering	Analytical Thinking (O) / Dependability (C)	Integrity (C)	Initiative (C)
Arts, Design, Entertainment, Sports, and Media	Dependability (C)	Adaptability and Flexibility (N)	Initiative (C) / Stress Tolerance (N)
Building, Grounds Cleaning, and Maintenance	Dependability (C)	Cooperation (A)	Self-Control (N)
Business and Financial Operations	Integrity (C)	Dependability (C)	Analytical Thinking (O) / Cooperation (A)
Computer and Mathematical	Analytical Thinking (O)	Dependability (C)	Cooperation (A)
Construction and Extraction	Dependability (C)	Cooperation (A)	Self-Control (N)
Education, Training, and Library	Dependability (C)	Integrity (C)	Self-Control (N)
Farming, Fishing, and Forestry	Dependability (C)	Self-Control (N)	Independence (C)
Food Preparation and Serving	Cooperation (A)	Dependability (C)	Self-Control (N)
Healthcare Support	Dependability (C)	Concern for Others (A)	Integrity (C)

Table 4: The relative importance of Big Five facets and factors to 23 job families representing approximately 1,102 occupations in O*Net (Big Five factors are in brackets), Cont'd

Job Family	O*NET Worker Style Characteristic		
	Top Ranked	Second Ranked	Third Ranked
Healthcare Practitioners and Technical	Integrity (C)	Dependability (C)	Concern for Others (A)
Installation, Maintenance, and Repair	Dependability (C)	Integrity (C)	Cooperation (A)
Legal	Integrity (C)	Dependability (C)	Analytical Thinking (O)
Life, Physical, and Social Science	Integrity (C)	Analytical Thinking (O)	Dependability (C)
Management	Dependability (C)	Integrity (C)	Leadership (E, A)
Office and Administrative Support	Dependability (C)	Integrity (C)	Cooperation (A)
Personal Care and Service	Dependability (C)	Self-Control (N)	Integrity (C)
Production	Dependability (C)	Cooperation (A)	Integrity (C)
Sales and Related	Dependability (C)	Integrity (C)	Self-Control (N)
Transportation and Material Moving	Dependability (C)	Self-Control (N)	Integrity (C)

Table 5: Relationships of the Big Five and a variety of workplace outcomes as determined by various meta-analyses totaling over 190,000 workers

	Job Performance	Task Performance	Organizational Citizenship Behavior	Counter-Productive Work Behavior
Conscientiousness	.33	.31	.40	-.40
Agreeableness	.22	.13	.23	-.51
Emotional Stability	.13	.11	.21	-.31
Openness	.10	.14	.04	-.08
Extraversion	.26	.15	.28	-.04

BIG FIVE PERSONALITY ASSESSMENT

SELF-REPORTS

- Self-reports have been used in noncognitive research for decades and have proven to be very efficient in gathering a lot of information over a brief period of time.
- Surveyed persons are asked to indicate their agreement with a number of different statements (e.g., “I like to work hard at school”).
- In order to gain more detailed information, respondents are not just answering whether they agree or not, but instead to report their level of agreement via Likert-type scales, which provide anywhere between four and seven response options that represent increasing grades of agreement.
- This type of assessment is preferred in environments when there are no stakes for the self-assessor and faking is not expected (Lipnevich et al., 2013). Respondents, however, may fake their responses on self-assessments to avoid having to attend training programs or to appear more attractive to a prospective school admissions officer, university system, or employer (Zickar, Gibby, & Robie, 2004).
- Fortunately, researchers have identified several promising methods for collecting data through self-reports while reducing fakability. These include giving real-time warnings, using a forced-choice format, and using one’s estimates of how others will respond to help control for faking (Ziegler, MacCann, & Roberts, 2011).

FORCED-CHOICE ASSESSMENT

- This procedure has many different aspects, including pair comparisons, rank-ordering, and multidimensional forced-choice.
- In pair comparisons, the test-taker must choose between two statements (e.g., which is more like you: “I work hard” or “I enjoy working in teams”?).
- In rank-ordering, test-takers must rank a series of equally desirable statements in order from “most like me” to “least like me.”
- In multi-dimensional forced-choice assessments, test-takers are presented with a dichotomous quartet of four different traits, in which two socially desirable statements are paired with two socially undesirable statements (Jackson, Wroblewski, & Ashton, 2000).
- There is compelling evidence to suggest that forced-choice tests are less fakeable than standard rating scales, and show stronger relationships with performance outcomes (Drasgow et al., 2012; Jackson et al., 2000).
- An empirically-based procedure for item selection and test development, combined with new statistical modeling techniques, seems to produce the best of all worlds: fake-proof normative tests that can also tell the individual how they score relatively on each dimension.

SITUATIONAL JUDGMENT TEST

- A Situational Judgment Test (SJT) is a type of test where test-takers are presented with variegated situations, each with several possible responses that must be evaluated (see Table 6 for an example).
- SJTs represent fairly simple, economical simulations of relevant school-, home-, or job-related tasks.
- This methodology is suitable for virtually any noncognitive skill (Lipnevich et al., 2013; MacCann & Roberts, 2008; Wang, MacCann, Zhuang, Liu, & Roberts, 2009).
- SJTs can be text-based or presented through multimedia, and responses can be multiple choice (i.e., pick the best response) constructed response (i.e., provide a response to this situation), or ratings (i.e., rate each response for its effectiveness on a Likert-type scale) (Lievens & Coetsier, 2002; Lievens & Sackett, 2006).

Table 6: A situational judgment test item measuring cooperation at the facet level, and Agreeableness at the Big Five factor level

You are part of a group assignment that your teacher has set on [any potential school topic]. As you are all dividing up the workload, it becomes clear that both you and another student are interested in the same topic. Your colleague has received good marks on this topic in the past, but you have been extremely excited about working on this part of the project for several months, even though it is new to you.

What would be the best response? (The participant is also asked what is the worst response immediately after this question, which is entered into the scoring model.)

- (a) Toss a coin to determine who gets to work on that particular aspect of the project.
- (b) Insist that, for the good of the group, you should work on that aspect of the project because your interest in the area means you will do a particularly good job.
- (c) Insist that, for the good of the group, you should work on that aspect of the project because you are able to give it more time.
- (d) Ignore your own desires and allow the other person to work on that aspect of the project.
- (e) Choose a different group member to work on that aspect of the project so that no one person is privileged over another.

BIOGRAPHICAL DATA

- Biographical data (also known as biodata) is another approach.
- In this paradigm, individuals are asked standardized questions about their past behaviors, activities, or experiences (e.g., “During the past month, how many times have you been involved in group projects?”).
- Respondents are offered multiple-choice answer options or are requested to answer questions in an open format (e.g., state frequency of behaviors).
- Biodata may offer a less fakeable method of assessment than standard self-assessment scales, as there are several test characteristics that can be implemented to minimize faking (Schmitt, Oswald, Kim, Gillespie, & Ramsay, 2003).
- These include asking individuals to elaborate on the biodata details (e.g., “What was the name of the last group project you did?”) or combining results obtained with alternative measurement approaches (e.g., self-assessments).
- It is noteworthy also that the biodata approach has variously survived legal challenges in high stakes (i.e., selection) contexts (<http://www.state.nj.us/csc/msb/decisions04/2004September/pdf/FAguannoEtAl.pdf>).