

HOGAN BUSINESS REASONING INVENTORY

M A N U A L

ROBERT HOGAN, PH.D. PAUL BARRETT, PH.D. JOYCE HOGAN, PH.D.



Brief Technical Manual

Hogan Business Reasoning Inventory - 1

Robert Hogan, Ph.D.

Paul Barrett, Ph.D.

Joyce Hogan, Ph.D.

Hogan Assessment Systems

Tulsa, OK 74114, USA

2009

© 2009 Hogan Assessment Systems, Inc. All rights reserved.

No part of this work may be copied or transferred to any other form or expression without the expressed written consent of Hogan Assessment Systems, Inc.

Hogan Personality Inventory™

Hogan Development Survey™

Motives, Values, Preferences Inventory™

Hogan Business Reasoning Inventory™

are the exclusive registered trademarks of Hogan Assessment Systems, Inc.

www.hoganassessments.com

ISBN 978-0-9840969-3-0

Contents

1. The Rationale of the Hogan Business Reasoning Inventory	4
1.1 <i>Introduction</i>	4
1.2 <i>An Evolutionary Model of Intelligence: Meta-Representation</i>	5
1.3 <i>Beyond Psychometric Models of Intelligence</i>	6
2. Test Design and Development	8
3. Normative Sample Composition	9
4. HBRI-1 Test-Properties	10
4.1 <i>Test Completion Time and Readability Statistics</i>	10
4.2 <i>Dimensionality</i>	10
4.3 <i>Normative Sample: Relevant Item and Scale Score Information</i>	13
4.4 <i>Reliabilities</i>	17
4.5 <i>Validities</i>	17
4.5.1 <i>Academic Ability Correlates</i>	17
4.5.2 <i>Watson-Glaser Critical Thinking Appraisal Correlates</i>	19
4.5.3 <i>Job Performance Correlates</i>	21
4.5.4 <i>Personality Correlates</i>	21
5. Adverse Impact	24
5.1 <i>Race/Ethnicity and Gender</i>	26
5.2 <i>Age</i>	28
6. Test Administration	29
6.1 <i>Administration</i>	29
6.2 <i>Computer Administrator Instructions</i>	30
6.3 <i>HBRI Taker Accommodations</i>	31
6.4 <i>HBRI Research Opportunities</i>	32
7. References	33
A.1 <i>Appendix</i>	35

1. The Rationale of the Hogan Business Reasoning Inventory

1.1 Introduction

Managers and executives must make periodic decisions about how best to allocate their scarce financial and human resources. Each decision they make is the result of a problem solving exercise. The history and success of every organization is the cumulative sum of these problem solving exercises and subsequent decisions. The quality of individual managerial problem solving and decision making is a function of intelligence.

Peter Drucker, the fabled philosopher of management, constantly emphasized that businesses get in trouble because senior managers exercise bad judgment (*cf. Drucker, 2006*). Managers are supposed to direct money and energy toward activities that increase profitability. Most often, however, they spend time and money solving problems and completing projects that don't matter. It takes clear-minded analysis to determine how appropriately to direct money and energy. Clear mindedness is a function of intelligence.

Drucker also emphasized that the root of every business crisis is the fact that the assumptions on which the business was built and is being run no longer fit reality. Drucker called these assumptions the "theory of the business." Constructing a valid theory of the business, and then subsequently evaluating and revising it, is a function of intelligence.

Menkes (2005) notes that, although most people understand the importance of clear mindedness for the success of a business, new managers and executives are rarely if ever selected on the basis of their ability to think clearly. Clear thinking is the same as intelligence as we define it. What is needed is a sound and defensible method for evaluating the ability of candidates for management and executive positions to think clearly.

Standardized intelligence testing was developed to predict academic performance. An effective measure of executive intelligence should predict clear thinking and effective management decision making. Drucker describes in very general terms what the key components are: thinking critically about the theory of the business by reviewing the assumptions on which it was founded and in terms of which it is being operated. We believe this process can be usefully specified in terms of time perspective as follows:

1. Past perspective: Are the operating assumptions of the business still valid?
2. Present perspective: Given the stated goals of the business, are people working on the right problems and tasks?
3. Future perspective: Given the stated goal of the business, have people appropriately anticipated the potential problems and possible outcomes?

Within each of these perspectives two kinds of thinking will apply. We call them “problem-finding” and “problem-solving;” later we also refer to these two kinds of thinking as “strategic reasoning” and “tactical reasoning.” Problem-finding involves detecting gaps, errors, or inconsistencies in data, trends, textual materials, or verbal arguments. Problem-solving involves determining what the right answer is, once a problem has been stated or framed correctly.

The Hogan Business Reasoning Inventory (HBRI) is based on the preceding discussion. It assumes that “intelligence” refers to clear thinking and is a key component of successful managerial performance. It assumes that intelligence involves constructing and evaluating a competent theory of the business. It assumes that two kinds of reasoning are essential to this process—problem finding and problem solving. It assumes that these two kinds of thinking can be measured, and that the results from this measurement process can be used to evaluate candidates for managerial and executive positions. And finally, it assumes that the results of this measurement process will predict successful performance as a manager or executive.

1.2 An Evolutionary Model of Intelligence: Meta-Representation

This section outlines our model of intelligence. The word “intelligence” is a recent addition to our language, and it is instructive to note that the ancient Greeks did not use the word. Rather they used words like clever, cunning, and wise to describe individual differences in performance. More importantly, all of these words have behavioral referents—people are only called clever if they routinely manifest a certain kind of performance. In our view, intelligence should be defined in terms of certain behaviors, and people refer to these behaviors when they conclude that someone has “good judgment” or, conversely, “poor judgment.”

If the word “intelligence” denotes something real, then it must be rooted in biology and promote individual and group survival—there must be adaptive consequences associated with individual differences in intelligent behavior. In a study of self-consciousness, Sedikides and Skowronski (1997) argue that self-awareness—the ability to think about one’s impact on one’s social environment—is an adaptive outcome of human evolution. They propose that self-awareness gave early humans an advantage relative to their major competitors.

We think that Sedikides and Skowronski (1997) are correct as far as they go—the capacity for self-reflection is a necessary precursor to intelligent behavior. However, we propose that intelligent performance depends on a more general capacity that can be called “meta-representation.” By meta-representation, we mean the ability to reflect on our performance (physical, social, intellectual) across all aspects of experience, to review it, and then evaluate it. The definition of stupidity is to continue doing something that yields a poor outcome but to expect that the outcome will improve if one persists in doing the same thing. In contrast, when smart athletes fall behind in a game, they reflect on their performance both on its own terms and relative to the competition, change their tactics, and then improve their performance—and this is why they are called “smart.”

Our hominid ancestors evolved (as group living animals) in an environment that was more demanding and less forgiving than ours (*Hogan, 1983*). In the ancestral environment, survival depended on being able to solve a wide variety of problems, including finding food, water, shelter, and protection from very nasty predators, keeping the peace within the group, and defending oneself and family against attacks by competing human groups. If the group members did not solve these problems correctly, they died; those that solved the entire range of problems prevailed. But present success is no guarantee of future success. The demands of survival changed constantly; those groups that adapted and improved their survival techniques in the face of constantly shifting environmental pressures became our more recent ancestors—the ultimate winners in the race for survival. Improving one's performance involves correctly anticipating future problems or recalling past performance that yielded better outcomes than those resulting from current performance. In either case, improving performance depends on the capacity for meta-representation, the ability to reflect on and evaluate one's performance, and then use the results of this reflection to improve subsequent performance.

Intelligent people can detect problems in their performance and then change it. They also can detect problems in other peoples' performance and encourage them to change it. Anthropologists and psychologists have traditionally argued that behavioral flexibility is the most important single human characteristic. Meta-representation is the key to behavioral flexibility. Crocodiles are competent hunters and proficient predators. Over time they have eaten many humans, but because crocodilian behavior is largely wired and inflexible, humans can, and do, hunt them to extinction.

1.3 Beyond Psychometric Models of Intelligence

We believe intelligence is manifested in the ability to solve a wide range of problems correctly—and this includes solving the problem of what to do when the old methods and solutions no longer work. We propose that the capacity for meta-representation provides the basis for the ability to do this. Spearman (1927) said something similar; namely, he argued that “g,” or general intelligence, is the ability to solve a variety of problems correctly. Binet (1903) suggested that the optimal method for measuring intelligence is to give people a large number of qualitatively different problems to solve. Intelligence is whatever underlies the ability to solve the various problems correctly. Such an assessment process, however, would be too unwieldy and time consuming to be useful; in addition, it ignores individual differences in personality. We think that the generic process of problem solving can be broken down into two components, “problem finding” and “problem solving” or “strategic and tactical intelligence.” We also believe that many previous writers have essentially concluded the same thing.

Early farmers learned to predict when the Nile would flood by watching the stars; certain regular changes in the position of the stars guided the planting process. This model of learning is the essence of science—science emerged and evolved through the process of detecting covariations (“When we do X, Y

happens”). In many, if not most cases that is as far as the analysis goes: neuroscientists still don’t know how anesthesia works, oenologists still don’t know in detail how wine fermentation works, every sailor knows the mantra, “Red skies at night, sailors delight; red skies in the morning, sailors take warning”, but they don’t know why. Based on these considerations, we initially proposed that “intelligence” is formed from two components: The ability (1) to detect covariations (i.e., to identify events that go together reliably); and (2) to recognize when the sequence is recurring or going to reoccur. More complex combinations come quickly to mind—for example, recognizing when covariations don’t occur—as in the case of Sherlock Holmes’ dog that didn’t bark. A more contemporary way of saying the same thing is that intelligence consists of: (a) developing schemas to forecast sequences of events in the world; and (b) subsequently applying those schemas appropriately. In any case, it is a two-step process.

It is instructive to read a definition of computational intelligence from the field of Artificial Intelligence, and see how closely it is in agreement with that described above. From Poole, Mackworth, & Goebel (1998, pp. 1-2).

Computational intelligence is the study of the design of intelligent agents. An agent is something that acts in an environment - it does something. Agents include worms, dogs, thermostats, airplanes, humans, organizations, and society. An intelligent agent is a system that acts intelligently: What it does is appropriate for its circumstances and its goal, it is flexible to changing environments and changing goals, it learns from experience, and it makes appropriate choices given perceptual limitations and finite computation.

It is not surprising that when man comes to build systems which exhibit “intelligence,” the definition of this intelligence is closely bound up with the detection of events or phenomena which may affect the optimal status of the organism/system (problem finding), and in response to these, the creation of appropriate steps to alleviate these “threats” (problem solving).

2. Test Design and Development

To establish an initial item pool, we wrote over 600 items for the HBRI content domains, representing a range of cognitive tasks and broad sampling of job duties within each domain. We wrote the item prompts to be as similar to the actual content of work within a business position as possible. We edited the vocabulary in each item to make the content as clear as possible and to minimize the verbal loading on non-verbal scales. We wrote all items with a single correct response and plausible distracters. Finally, we designed the items to take 1.5 minutes or less to complete. We included items with a wide range of difficulties by varying the cognitive task complexity within each content domain.

The items were reviewed by three groups of experts. First, ten HAS senior staff members completed a subset of the items along with questions regarding the quality and face validity of each item. We conducted a debriefing session individually with these people, and used the results to modify the content of item prompts, stems, and response options.

Second, external subject matter experts (SMEs) reviewed the revised item pool. This group consisted primarily of I/O psychologists with expertise in cognitive ability testing, psychometrics, adverse impact litigation, personnel selection, and leadership. This group provided feedback on the theory of the test, comparisons with other ability tests, the potential for adverse impact, and the item content. We used the results of this review to revise several items, reject a small set, and write test scoring and administration guidelines.

The third group of reviewers included human resource practitioners and business managers. This group represented potential stakeholders in the HBRI testing process. They each provided written and verbal feedback on a set of 36 HBRI items and the total test. Once again, the results were positive overall regarding the HBRI, with a few additional item content revisions and ideas for additional item content. From these content and SME analyses, we chose 186 items for initial field testing based on representation of content across all strata (i.e., factor structure, cognitive demands, and job analysis results). After two years of such testing, those items showing optimal psychometric and scale properties were chosen to form the current version of the HBRI.

3. Normative Sample Composition

The current normative sample dataset of 2,484 individuals is combined from various sources including university students, adult volunteers, job applicants, and existing employees.

Table 3.1
Gender: Using those who provided a gender code

	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Men	1575	1575	64.4	63.4
Women	878	2453	35.3	98.8
Missing	31	2484	1.2	100.0

Table 3.2
Age: Using those cases who provided a valid age (between 17 and 74 yrs)

	N	Mean	Standard Deviation	Minimum	Maximum
Age	2248	34.5	9.9	17	74

And in terms of two age groups which are used to examine adverse impact in a selection scenario:

Table 3.3
Age Groups

	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Age < 40	1600	1600	64.4	64.4
Age => 40	648	2248	26.1	90.5
Missing	236	2484	9.5	100.0

Table 3.4
Race/ethnicity

Race/Ethnic Group	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Others	45	45	1.8	1.8
Black	361	406	14.5	16.3
Hispanic	88	494	3.5	19.9
Asian American/Pacific Islanders	150	644	6.0	25.9
American Indians/Alaskan Natives	27	671	1.1	27.0
White	1587	2258	63.9	90.9
Not Indicated	184	2442	7.4	98.3
Declined	32	2474	1.3	99.6
Missing	10	2484	0.4	100.0

4. HBRI - 1 Test Properties

Here we present the essential features and characteristics of the test. From analyses of the various forms of the test, the final 2-dimensional simple-structure factor pattern was generated using the largest database containing respondent information on the “best characteristic.” 36 items. The number of items in the final version of the test was minimized so as to reduce respondent test administration time, while preserving optimal assessment characteristics for each scale (problem solving [Tactical reasoning] and problem identification [Strategic reasoning]).

4.1 Test Completion Time and Readability Statistics

Although the test is untimed, the estimated time for test completion is ~30 minutes, using a 24-item computer administered test, with 9 scored items comprising each scale, and a total HBRI scale score computed across 18 items. Some items are used as easy “fillers,” to ensure an individual gains enough practice before encountering the harder scored items. Other unscored items at the end of the test ensure a positive finish.

The HBRI is intended for use with college educated managers and professionals. As such, the examinee(s) should be screened against three criteria prior to administration. Examinees should have, at a minimum, completed a Bachelor’s degree. Examinees who have fulfilled this educational requirement should have sufficient mastery of the English language to complete the HBRI. The text of the HBRI is, however, at a ninth grade reading level, as measured by the Flesch-Kincaid scale. Thus, any examinee for whom English is a second language should read proficiently at a ninth grade level. Finally, examinees should not have taken any form of the HBRI within six months of the assessment date. This six month requirement is designed to minimize the impact of practice effects should anyone retake the HBRI.

4.2 Dimensionality

The final exploratory component analysis undertaken on the 2484 cases and 18 scored items of the test, using principal components analysis of Pearson correlations, followed by direct oblimin oblique rotation of two components yielded the component factor pattern and factor correlation reported in the first two columns of Table 4.1. For clarity of reporting, all component loadings below .2 have been set to .0. Also, the item numbers have been removed in this table for test security purposes. The second pair of columns of this table report the result of a maximum likelihood constrained-loading factor analysis on the same data, using the pre-specified 2-factor HBRI model. The aim of this analysis was simply to determine how the common factor loadings for the items would “hold up” when all non-keyed loadings were constrained to zero. We estimated the loadings for all keyed items, along with the factor correlation (which provides an estimate of the error-free correlation between the two constructs).

The fit of the constrained model produced a CFI of 0.95, with RMSEA of 0.03, and χ^2 of 479.55 with 134 df ($P < 0.0001$). But, we are not overly concerned with model fit here even though many would accept the fit indices as indicative of “approximate fit;” the attempt to produce a constrained solution was undertaken to show that even when non-keyed loadings are set to zero, the essential factor pattern remains substantively unaffected.

Further, it might be argued that the use of Pearson correlations is incorrect for this kind of dichotomous response item variable, and that a tetrachoric index might be optimal. Although we did undertake some tetrachoric analyses, little changed except that a 100%-plus increase in variance extracted was observed, and the keyed loadings increased their size accordingly (improving the signal-to-noise ratio with non-keyed loadings). But, using tetrachorics with these data is actually quite wrong. An item response on the HBRI is not a binary function overlaid on a continuous valued response variable. For example, if we measured temperature in degrees Centigrade, and % Humidity, as High or Low (around some point-value on each respective scale), then we would be justified in using a tetrachoric coefficient if we felt the variables were bivariate-normal distributed in the population, as both are “dichotomized” versions of underlying continuous-valued variables. But, a problem solving item on the HBRI has just one correct answer. It is not a function of “correctness” where some responses are “more correct than others” on a continuous-valued function of correctness. To pretend otherwise is foolish. Thus, from a statistical viewpoint, items are simply discrete binary response variables for which many kinds of measures of agreement exist (*Sneath & Sokal, 1973*). But indexes like these do not rely upon notions of additive-metric covariance. In the end, if we are to use conventional factor analysis and psychometrics to describe features of our test, then we might as well use the Pearson coefficient and proceed accordingly, with a realistic appreciation that the analyses are being implemented for pragmatic purposes, and that the validity of the resultant test scores will be assessed with regard to their concurrent and predictive validity (*Barrett, 2003*).

Table 4.1
The Component and Constrained Factor Analysis Patterns for the HBRI-1

	Unconstrained Simple Structure Principal Component Factors		Constrained Maximum Likelihood Common Factors	
	Tactical F1	Strategic F2	Tactical F1	Strategic F2
Tactical a)	.381	.201	.445	.000
Tactical b)	.604	.000	.538	.000
Tactical c)	.656	.000	.614	.000
Tactical d)	.653	.000	.575	.000
Tactical e)	.654	.000	.559	.000
Tactical f)	.611	.000	.563	.000
Tactical g)	.687	.000	.576	.000
Tactical h)	.596	.000	.528	.000
Tactical i)	.518	.000	.445	.000
Strategic a)	.262	.276	.000	.401
Strategic b)	.271	.316	.000	.449
Strategic c)	.268	.320	.000	.451
Strategic d)	.000	.647	.000	.402
Strategic e)	.268	.381	.000	.497
Strategic f)	.322	.255	.000	.448
Strategic g)	.000	.601	.000	.584
Strategic h)	.000	.575	.000	.280
Strategic i)	.000	.540	.000	.439
Factor correlation	.38		.80	

As can be seen from Table 4.1, the two factors are nicely separable in terms of a simple structure criterion, although the component factor correlation suggests substantive obliquity, with the constrained “confirmatory” analysis showing a latent variable correlation of 0.80 (equivalent to a disattenuated correlation between scale scores as seen in section 4.2 below). One would expect a common reasoning component to underlie both constructs – so some correlation is to be expected. From a more theoretical perspective, the correlation might be viewed as being slightly elevated, but this represents the manner in which the constructs have been operationalized in the current version of the HBRI. This is a difficult issue as the current theoretical foundation of the HBRI does not provide a precise estimate of expected construct covariance. However, the current normative correlation still allows for considerable unique variation even when allowing for measurement error (36% unshared variation).

4.3 Normative Sample: Relevant Item and Scale Score Information

These calculations were computed over the $n = 2,484$ normative sample dataset (see Section 3 above)

Table 4.2
Scale Score Information

Scale	No. of items	Mean	SD	Maximum scale score	alpha	SEmeas Model 3	Mean item-total
Tactical	9	7.3	2.1	9	.78	1.3	.47
Strategic	9	5.4	2.3	9	.68	1.69	.36
Total	18	12.7	3.9	18	.82	2.23	.21

Note. The Strategic vs Tactical scale observed correlation is 0.58 (disattenuated = 0.80)

It is important to note here that we are using the formula provided by Dudek (1979) for the standard error of measurement, as it is the more conservative and correct formula to be used when attempting to place confidence intervals around observed scores. We use the appropriate equation specifically for the case where the aim is to compute the standard deviation of observed scores if the observed score is held constant:

$$sem_3 = s_T \sqrt{(1 - r_{xx}^2)}$$

where

s_T = the standard deviation of the scale scores

r_{xx} = the reliability of the test

As Nunnally (1978, pp 259-260) indicate, this is the optimal formula to be used when requiring an estimate of the standard error of measurement of observed rather than true scores, using observed scores rather than estimated true scores as the initial score estimates. The conventional formula used is:

$$sem_1 = s_T \sqrt{(1 - r_{xx})}$$

where

s_T = the standard deviation of the scale scores

Th r_{xx} = the reliability of the test

ange of observed scores for a fixed true score, and not an observed score. That is, to express the likely error around an observed test score, one should more correctly use sem_3 rather than sem_1 . This does result in a slightly larger standard error of measurement than using the formula appropriate for true scores, but is relevant where concern is in estimating future observed scores from existing observed scores.

The frequency distributions and score histograms for the three HBRI scale scores are presented in Figures 1, 2, and 3, and Tables 4.3 to 4.5 below:

Figure 1
Histogram - Tactical Scale Scores (M = 7.3)

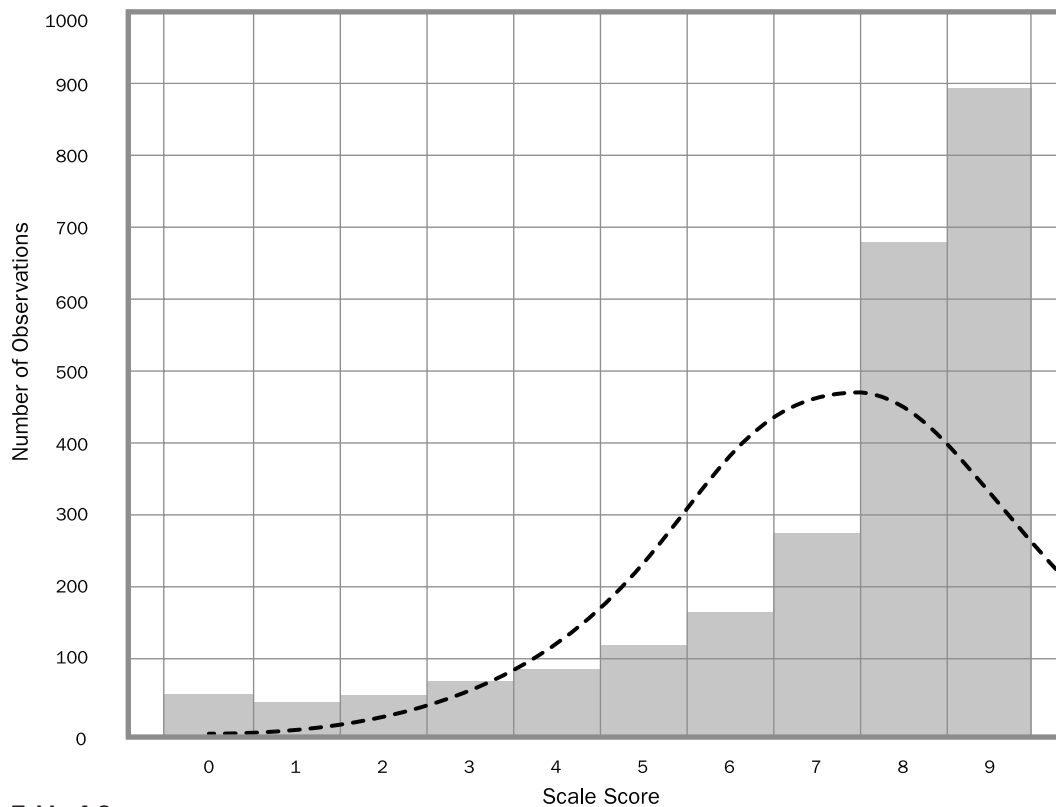


Table 4.3
Score Frequency Histogram for the Tactical Scale

Frequency Table: HBRI-1 Tactical Scale				
Category	Count	Cumulative Count	Percent	Cumulative Percent
0	47	47	1.89	1.89
1	32	79	1.29	3.18
2	43	122	1.73	4.91
3	68	190	2.74	7.65
4	86	276	3.46	11.11
5	119	395	4.79	15.90
6	165	560	6.64	22.54
7	357	917	14.37	36.92
8	674	1591	27.13	64.05
9	893	2484	35.95	100.00
Missing	0	2484	0.00	100.00

Figure 2
Histogram - Strategic Scale Scores (M = 5.4)

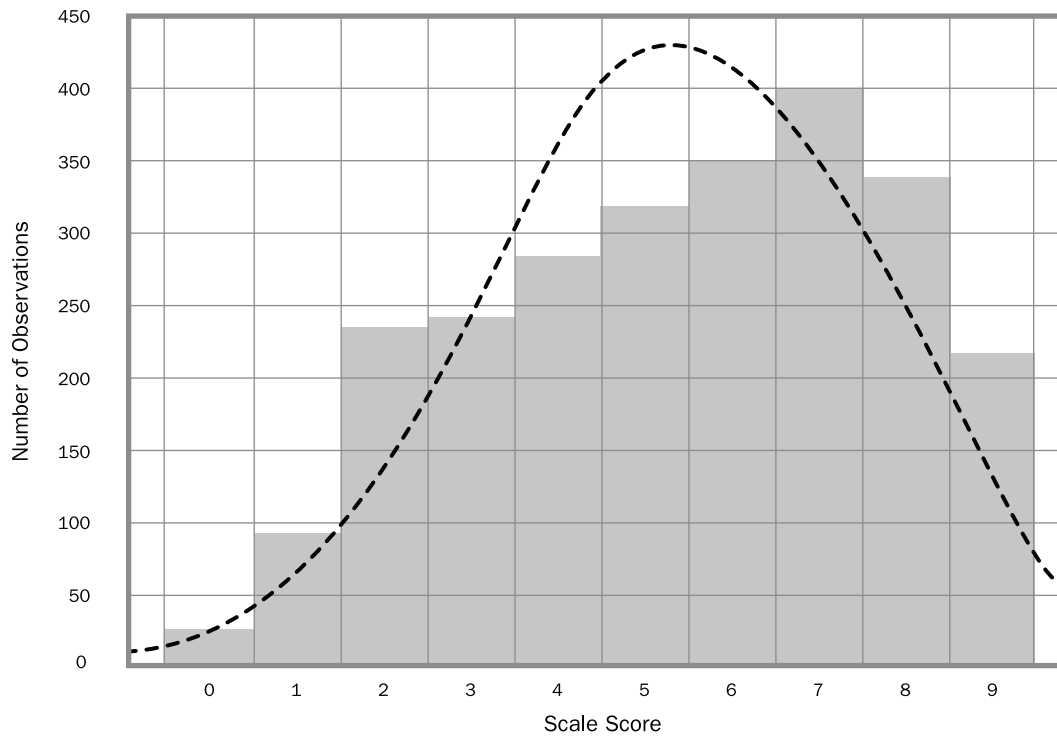


Table 4.4
Score Frequency Histogram for the Strategic Scale

Frequency Table: HBRI-1 Strategic Scale				
Category	Count	Cumulative Count	Percent	Cumulative Percent
0	23	23	0.93	0.93
1	93	116	3.74	4.67
2	235	351	9.46	14.13
3	240	591	9.66	23.79
4	286	877	11.51	35.31
5	316	1193	12.72	48.03
6	346	1539	13.93	61.96
7	402	1941	16.18	78.14
8	336	2277	13.53	91.67
9	207	2484	8.33	100.00
Missing	0	2484	0.00	100.00

Figure 3
Histogram – Total HBRI Scale Scores (M = 12.7)

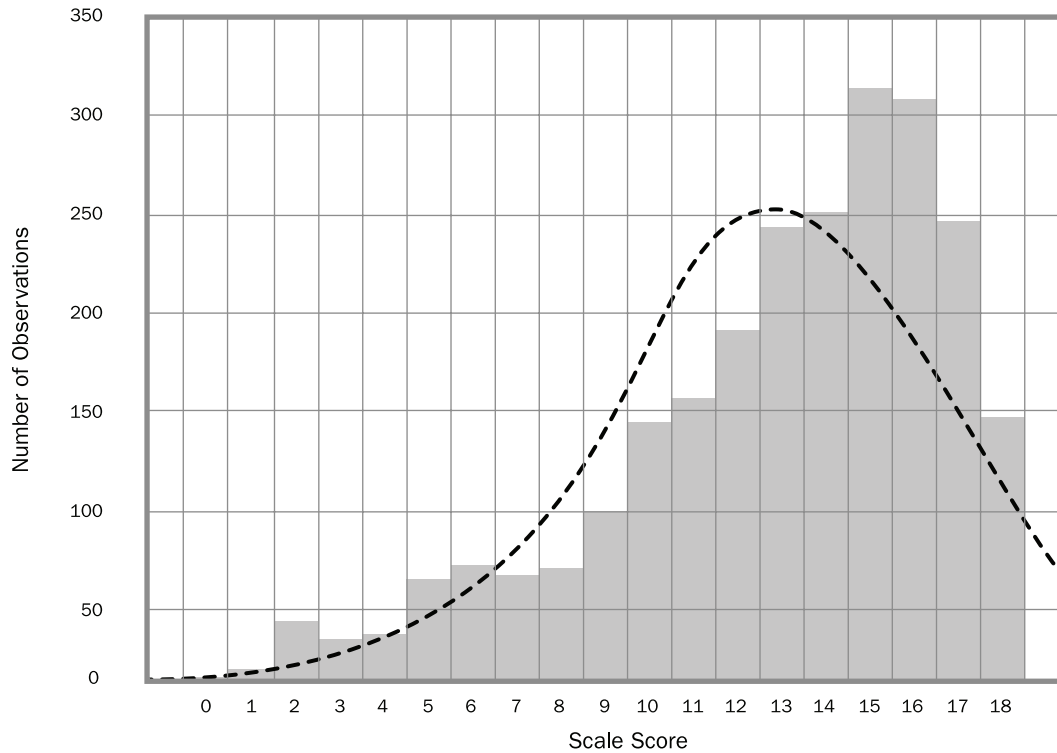


Table 4.5
Score Frequency Histogram for the HBRI-Total Scale

Category	Count	Cumulative Count	Percent	Cumulative Percent
0	2	2	0.08	0.08
1	5	7	0.20	0.28
2	41	48	1.65	1.93
3	28	76	1.13	3.06
4	30	106	1.21	4.27
5	63	169	2.54	6.80
6	73	242	2.94	9.74
7	67	309	2.70	12.44
8	71	380	2.86	15.30
9	101	481	4.07	19.36
10	143	624	5.76	25.12
11	156	780	6.28	31.40
12	191	971	7.69	39.09
13	242	1213	9.74	48.83
14	250	1463	10.06	58.90
15	319	1782	12.84	71.74
16	310	2092	12.48	84.22
17	248	2340	9.98	94.20
18	144	2484	5.80	100.00
Missing	0	2484	0.00	100.00

4.4 Reliabilities

Currently, only internal consistency Cronbach alpha reliabilities are available for this version of the test. For the normative sample data of $n = 2,484$ cases, these are:

Tactical: .78

Strategic: .68

Total Scale: .82

However, during the item trial procedures, a 30-item test was administered to a small sample of 46 university undergraduate students using a two-week retest interval. Test-retest reliability estimates were $r_{tt} = .90$ and $.87$ for the strategic and tactical reasoning scales, respectively, and $r_{tt} = .92$ for the HBRI total scale. But, the item composition of these scales is substantially different, so these data can only be taken as indicative of expected values and not as the actual calculated values for the current version of the test.

4.5 Validities

Here we focus on the examining the relationships between the HBRI scales and three domains of relevant variables, academic, a conventional test of managerial reasoning ability, and job performance indicators.

4.5.1 Academic Ability Correlates

A sample of 112 university undergraduates enrolled in upper division business classes at a large southwestern university were administered a 36-item item trial version of the test, within which the new HBRI test scales were located. The academic variables of interest were the American College Test (ACT) entrance examination, which assesses high school students' general educational development and their ability to complete college-level work; student's Grade Point Average (GPA), and the General Aptitude Test Battery (*GATB Form E; Segall & Monzon, 1995*). Specifically, the scores noted for each student (where possible) were their ACT, undergraduate GPA, GATB Arithmetic reasoning (GATB-AR), GATB Vocabulary, and the total GATB score. Some academic variable data were missing for a few students.

Table 4.6
ACT, GPA, and GATB Correlations with the HBRI

	Sample Size	HBRI-Tactical	HBRI-Strategic	HBRI-Total Score
ACT	87	.19 (n.s.)	.28	.28
Undergraduate GPA	110	.22	.22	.27
GATB-Arithmetic Reasoning	106	.43	.28	.44
GATB-Vocabulary	106	.40	.26	.41
GATB-Total	106	.51	.31	.51

Note. All correlations except that marked "n.s." are statistically significant at $P < 0.05$

Substantive correlations are found between the academic variables and the HBRI, with the Tactical scale scores (problem solving) showing the largest relationship to the academic test scores. This makes good sense as academic tests are primarily straightforward problem solving tasks rather than those requiring the kind of "problem identification" analytical approach which is the hallmark of Strategic reasoning.

A second discrete sample of students who were also enrolled in upper division business classes at a large southwestern university completed the same 36-item item trial version of the test, within which the new HBRI test scales were located. For 155 of these, we were able to correlate their Graduate Management Admission Test (GMAT) scores to their HBRI scale scores. For a larger subset of students, we were able to correlate their Scholastic Aptitude Test (SAT) scores with their HBRI scores. Table 4.7 below provides the correlations:

Table 4.7
GMAT and SAT Correlations with the HBRI

	Sample Size	HBRI-Tactical	HBRI-Strategic	HBRI-Total Score
GMAT	155	.19	.22	.25
SAT	252	.04 (n.s.)	.21	.12 (n.s.)

Note. All correlations except those marked "n.s." are statistically significant at $P < 0.05$. The SAT scores ranged between 555 and 1580.

4.5.2 Watson-Glaser Critical Thinking Appraisal Correlates

Here we examined the relationship between the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 2002) subtest and total test scores and the HBRI scales, using a sample of 276 managers employed in a national transportation industry.

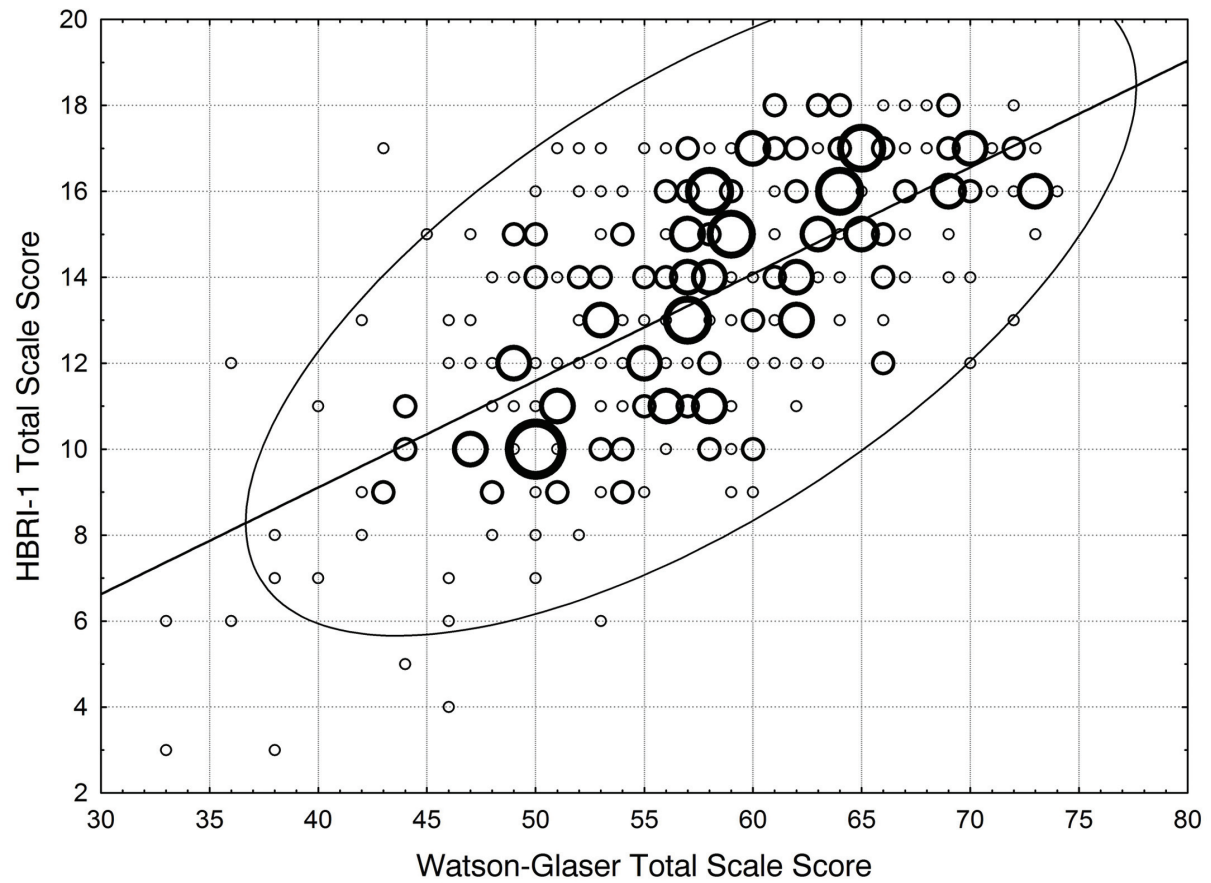
Table 4.8
Watson-Glaser Critical Thinking Appraisal Correlations with the HBRI

	HBRI-Tactical	HBRI-Strategic	HBRI-Total Score
Evaluation of Arguments	.29	.32	.36
Inference	.37	.37	.42
Recognition of Assumptions	.31	.38	.41
Deduction	.38	.53	.55
Interpretation	.39	.48	.52
Total Watson-Glaser Score	.51	.61	.66
Note. N = 276. All correlations are statistically significant at $P < 0.01$			

The correlations are all statistically significant, with substantive correlations between the HBRI-Strategic and Total scale scores and Watson-Glaser total score. As expected, we mostly observe higher correlations between the Watson-Glaser and HBRI Strategic subscale, in contrast to the lower values with the Tactical subscale. This reflects the “strategic” component which is, in part, being assessed in both tests.

Figure 4 below shows a bubble plot of the relationship between the two main scale scores. Within this graph, the larger the bubble, the more influence points in this region have on the correlation coefficient. The ellipse marks the boundary where 95% of all observations are expected to be found, given a bivariate normal distribution. This scatterplot indicates that the correlation of .66 is not due to outlier or extreme observations.

Figure 4
Bubble Influence Scatterplot for HBRI-1 and Watson-Glaser Critical Thinking Appraisal Total Scores



4.5.3 Job Performance Correlates

A sample of data was acquired from job incumbents where supervisor ratings of job performance were also available for analysis. These data allow us to examine real-world HBRI-job performance relationships. The sample consisted of 104 cases of managers at a pharmaceutical manufacturing company who undertook the test as part of a development program. Ratings were made of their performance across seven variables which emerged from a previous competency requirement analysis of the job. The relationships between the HBRI scales and these ratings are reported in Table 4.9 below.

Table 4.9
Job Performance Ratings Correlated with the HBRI

	HBRI-Tactical	HBRI-Strategic	HBRI-Total Score
Technical Skill/Effectiveness	.10	.08	.10
Networking/Building Relationships	-.06	-.15	-.14
Professionalism/Maturity	-.07	.04	.00
Leadership/Project Management	.04	.00	.02
Organizational Fit	.00	-.05	-.04
Persuading/Communicating	.21	.11	.17
Advancement Potential	.30	.18	.26

Note. N = 104. All correlations marked in bold type are statistically significant at $P < 0.05$.

What these show is that the ratings on the variable “Advancement Potential” are associated with HBRI scores. Of course, if we corrected these correlations for unreliability of both predictor (0.68, estimated using the normative test sample) and criterion (~ 0.5 , the usual estimate for supervisor rating reliability), a correlation of .30 is transformed to one of .48. But, without an empirical estimate of the actual sample reliability and the assessed inter-rater reliability of the raters, such “extrapolative” evidence is more “suggestive” than factual.

4.5.4 Personality Correlates

Subsets of the people in the normative data sample described in Section 3 completed the HBRI along with two personality measures. These were the Hogan Personality Inventory (HPI; R. Hogan & Hogan, 1995, 2007) and the Hogan Development Survey (HDS; R. Hogan, & Hogan, 1997). We used these data to examine the relations between cognitive and non-cognitive measures. Although research investigating personality and intellectual problem solving is sparse, there are some studies beyond those that explore the incremental validity of personality measures to cognitive ability. Chamorro-Premuzic and Furnham (2005, pp.42-67) point out that probably less than a dozen recent quantitative studies integrate personality and intelligence measures. There are two consistent personality-cognitive performance findings. First, there appears to be a modest, but significant correlation ($r = -.15$) between the personality factor labeled “emotional stability” and psychometric intelligence and it has been

interpreted as test anxiety. Second, there are relations between cognitive ability and the personality factor “intellect/openness to experience,” including the HPI Inquisitive and/or Learning Approach scales (*R. Hogan & Hogan, 2007*). Some researchers interpret this relation as a prediction of self-assessed ability (*Cattell, Eber, & Tatsuoka, 1970*) while others argue that a portion of true variance in the intellect/openness to experience factor can be attributed to intelligence (*Brand, 1994*). We prefer an interpersonal interpretation where people who are intellectually competent are seen by others as imaginative, curious, interested in intellectual pursuits, and resourceful problem solvers. In our view, it is these interests, values, and behavioral styles that are shared by higher scorers on the two measures.

The HBRI and HPI scale intercorrelations appear in Table 4.10. The HPI is a measure of normal personality based on the Five-Factor Model (FFM; see *DeRaad & Perugini, 2002*). The HPI contains 206 items scored in seven scales. The HPI scales represent the FFM in the following way: (a) I. Surgency corresponds to HPI Ambition and Sociability; (b) II Agreeableness corresponds to HPI Interpersonal Sensitivity; (c) III Conscientiousness corresponds to HPI Prudence; (d) IV Emotional Stability corresponds to HPI Adjustment; and (e) V Intellect/Openness to Experience corresponds to HPI Inquisitive and Learning Approach. As seen in Table 4.10, the most significant pattern of correlations across the HPI and HBRI scales are for HPI Adjustment, Ambition, and Learning Approach, with the Adjustment scale achieving the highest correlations for Tactical and Strategic Reasoning (as well as total HBRI). These results provide some support for the consistent personality-cognitive performance findings reported by *Chamorro-Premuzic and Furnham (2005)*.

Table 4.10
Correlations Between Hogan Personality Inventory Scale Scores and HBRI Scales

HPI Scales	HBRI Tactical	HBRI Strategic	HBRI Total Score	Time In Minutes
Adjustment	.35**	.24**	.33**	.17**
Ambition	.30**	.19**	.28**	.15**
Sociability	-.01	.05*	.03	.02
Interpersonal Sensitivity	.19**	.09**	.15**	.14**
Prudence	.22**	.08**	.16**	.19**
Inquisitive	.11**	.14**	.14**	.04
Learning Approach	.18**	.19**	.21**	-.04

Note. N = 2340 for all correlations except the “Time in Minutes” variable where N = 512.
 ** Correlations are statistically significant at $P < .0.01$; * Correlations are statistically significant at $P < 0.05$. Two-tailed, directional relations not hypothesized a priori.

The HBRI and HDS scale intercorrelations appear in Table 4.11. The HDS is a measure of career derailing tendencies including 11 patterns of behavior that impede work relationships, hinder productivity, or limit overall career potential. The eleven scales of the HDS contain 168 items which are grouped into three broad categories. The categories or factors are: (a) Moving Away which includes the scales of Excitable, Skeptical, Cautious, Reserved, and Leisurely; (b) Moving Against which includes the scales of Bold, Mis-

chievous, Colorful, and Imaginative; and (c) Moving Toward which includes the scales Diligent and Dutiful. As seen in Table 4.11, the most significant pattern of correlations across the HDS and HBRI scales are for the HDS scales aligned with the Moving Away category. The trend here suggests that persons scoring high on HDS Excitable, Skeptical, Cautious, Reserved, and Leisurely have difficulty identifying (Strategic) and solving (Tactical) problems in a timely manner. Specifically in terms of Strategic Reasoning, persons with high Moving Away scores may be defensive. They tend to focus on identifying and avoiding potential threats and challenges, and will tend to discount positive opportunities. In terms of Tactical Reasoning, they may be uneven in their performance. They approach tasks with a sense of urgency, and work diligently until they encounter difficulties. They are easily frustrated and upset; as their irritation mounts, their problem solving becomes uneven and possibly degraded.

Table 4.11
Correlations Between Hogan Development Survey Scale Scores and HBRI Scales

HDS Scales	HBRI Tactical	HBRI Strategic	HBRI Total Score	Time In Minutes
Excitable	-.24**	-.19**	-.24**	-.20*
Skeptical	-.23**	-.17**	-.22**	-.01
Cautious	-.23**	-.14**	-.20**	-.14
Reserved	-.18**	-.12**	-.16**	-.12
Leisurely	-.18**	-.11**	-.15**	-.11
Bold	-.02	-.01	-.02	.10
Mischievous	-.08**	.04	-.01	-.12
Colorful	.02	.06*	.05	.08
Imaginative	-.13**	-.03	-.08**	-.10
Diligent	.05	-.05	-.01	.03
Dutiful	-.01	-.08**	-.06*	.01

Note. N = 1082 for all correlations except the "Time in Minutes" variable where N = 121.
 ** Correlations are statistically significant at $P < .0.01$; * Correlations are statistically significant at $P < 0.05$. Two-tailed, directional relations not hypothesized a priori.

5. Adverse Impact

Adverse impact is a concern when using any cognitive test. Adverse impact (AI) is clearly defined in existing law and professional guidelines by the ratio between selection rate of any “race, sex, or race/ethnic group which is less than four-fifths (4/5) (or eighty percent) of the rate for the group with the highest rate...” If the ratio is equal to or below .80 (i.e., 4/5’s rule), there is evidence for AI under the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunities Commission, 1978).

But, an important caveat must be borne in mind. Any HBRI unequal selection ratios may not reflect adverse impact but genuine performance-related discrepancies between population sub-groups, indexed by the three scales and justified by an empirical relationship between the scale scores and evidence-based on-the-job-performance criteria. In employment selection, this distinction is described as unfair versus fair discrimination (Arvey & Faley, 1988), or adverse versus valid impact.

We think it is worth considering the key clauses of, and our response to, existing employment legislation.

Uniform Guidelines On Employee Selection Procedures (UGESP) General Principles for Documentation of Impact and Validity Evidence

UGESP Section 15 contains documentation information required for selection procedures with adverse impact. Note, the UGESP do not require a user to conduct validity studies of selection procedures where no adverse impact results. Virtually all cognitive ability tests sold commercially in the United States result in adverse impact unless selection cutoff scores are set sufficiently low that rejection rates are low. Therefore, validation of such tests is essential under the UGESP. The summary below presents selected documentation requirements for tests with adverse impact.

Sec. 15A(1)(c) “If the user has reason to believe that a selection procedure has an adverse impact, the user should maintain any available evidence of validity for that procedure.”

Comment. The history of cognitive ability testing and employment discrimination case law suggest that there is “reason to believe” that cognitive ability tests may have adverse impact when 2% of the relevant labor force consists of black, Hispanic, American Indian/Alaskan Native, Pacific Islander, and or female groups.

Sec. 15A(2)(a) “Where a total selection process for a job has an adverse impact, the user should maintain and have available records or other information showing which components have an adverse impact.”

Comment. Although it is likely that not all components of a selection solution will have adverse impact, those components that do and whose effects are not offset by other components will carry over their results to the total selection outcome.

Sec. 15A(3)(a) “Where a total selection process has an adverse impact, the user should maintain and have available for each component of that process which has an adverse impact, one or more of the following types of documentation evidence: (i) Documentation evidence showing criterion-related validity of the selection procedure...(iv) Documentation evidence from other studies showing validity of the selection procedure in the user’s facility”.

Comment. Our research suggests that other non-cognitive selection measures are unlikely to compensate for scores on a cognitive measure, therefore, such measures are unlikely to reduce the effects of adverse impact resulting from a cognitive test. This is because there is little relation or overlap between cognitive test scores and non-cognitive test scores. The effects of combining these types of measures will be more or less random with some individuals achieving higher overall scores while others receive lower scores when all components are combined. For a test such as the HBRI, the validation strategy of relevance usually will be criterion-related validity. Also, we expect that as test use becomes more widespread, validity generalization methods will be appropriate both within and between organizations.

Sec. 15A(3)(b) *“This evidence should be compiled in a reasonably complete and organized manner to permit direct evaluation of the validity of the selection procedure.”*

Comment. Under criterion-related validity, documentation of job information, criterion measures, research sample, predictor measure(s), results, and alternatives investigated are essential.

Sec. 15A(3)(c) *“In the event that evidence of validity is reviewed by an enforcement agency, the validation reports completed after the effective date of these guidelines are expected to contain the information set forth below. Evidence denoted by use of the word “(Essential)” is considered critical.”*

Comment. The following topics of documentation are required for criterion-related validity studies. We summarize only some essential points under Sec. 15B.

- (1) User, location, and dates of study
- (3) Job analysis or review of job information
- (5) Criterion measures—the bases for the selection of criterion measures should be provided, they need to be described, and the means by which they were gathered should be explained.
- (6) Sample description—a description of how the research sample was identified and selected should be included and the race/ethnicity and gender of this sample is essential.
- (7) Description of selection procedures
- (8) Techniques and results—data analysis methods must be described. “Measures of central tendency (e.g., means) and measures of dispersion (e.g., standard deviations and ranges) for all selection procedures and all criteria should be reported for each race, sex, and ethnic group which constitutes a significant factor in the relevant labor market. The magnitude and direction of all relationships between selection procedures and criterion measures investigated should be reported for each relevant race, sex, and ethnic group and for the total group.”
- (10) Uses and applications—methods for using the selection procedure (e.g., screening with a cutoff score) and available evidence of impact should be described. The rationale for choosing the method for operational test use and the evidence of validity and utility of the procedure as it is to be used must be documented. Finally, when a cutoff score is recommended for operational use, the user must describe the way in which the cutoff score reflects normal expectations of proficiency within the work force.
- (11) Source data—all information from validation studies, including job analysis data, as well as predictor and criterion data should be maintained in a retrievable database. Scores should be maintained by race/ethnicity as well as gender, however, names and social security numbers should be redacted.

Clearly, reporting the available facts and evidence concerning the impact of a test's scores amongst population subgroups is not an option, it is mandatory.

Attempts to minimize the mean differences that may lead to AI were made throughout the development of the HBRI. Unfortunately, AI cannot be directly assessed without pass rates from an operational selection system. It is possible, however, to examine both mean HBRI score differences between protected and majority groups as a proxy of AI, and to directly examine AI ratios using each score level of a scale as a potential cutoff. When used for selection, cut-scores should be examined in this way to determine the potential for Adverse Impact.

The next two sections reports the essential descriptive statistics which speak to impact due to race/ethnicity, gender, and age. For all analyses, we used the normative sample dataset.

5.1 Race/Ethnicity and Gender

The frequencies associated with each race/ethnic group in the dataset are provided in Table 5.1 below.

Table 5.2 provides the means and standard deviations for each group.

Table 5.1
Race/Ethnic Group Frequencies

Race/Ethnic Group	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Others	45	45	1.8	1.8
Black	361	406	14.5	16.3
Hispanic	88	494	3.5	19.9
Asian American/Pacific Islanders	150	644	6.0	25.9
American Indians/Alaskan Natives	27	671	1.1	27.0
White	1587	2258	63.9	90.9
Not Indicated	184	2442	7.4	98.3
Declined	32	2474	1.3	99.6
Missing	10	2484	0.4	100.0

Table 5.2
The Score Means and Standard Deviations for the Five Race/Ethnic Groups

Scale		Whites n=1587	Blacks n=361	Hispanics N=88	Asian American/. Pacific Islanders N=150	American Indians/ Alaskan Natives N=27
HBRI-1 Tactical		7.6	6.2	7.1	7.3	5.6
	SD	1.94	2.40	2.07	2.16	2.29
HBRI-1 Strategic		5.7	3.9	5.0	5.7	4.0
	SD	2.21	2.15	2.11	2.28	1.95
HBRI-1 Total		13.3	10.1	12.1	13.0	9.6
	SD	3.69	3.90	3.78	3.97	3.73

With regard to gender, Table 5.3 provides the frequencies of men and women in the dataset:

Table 5.3
Gender Frequencies

	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Men	1575	1575	64.4	63.4
Women	878	2453	35.3	98.8
Missing	31	2484	1.2	100.0

Table 5.4
Means and Standard Deviations for Men and Women on the HBRI

Scale		Men n=1575	Women n=878
HBRI-1 Tactical		7.5	7.0
	SD	1.97	2.26
HBRI-1 Strategic		5.8	4.8
	SD	2.24	2.29
HBRI-1 Total		13.3	11.7
	SD	3.76	4.00

5.2 Age

In the normative sample, 2,248 individuals provided a valid age between the ages of 17 and 74 years. The mean age for the entire sample was 34.5 years, with a standard deviation of 9.92 years. For the purposes of the adverse impact analysis, the individuals were divided into two groups, one including individuals aged < 40, the other including individuals equal to or greater than 40 years of age. Table 5.5 provides the frequencies in each group, while Table 5.6 shows the means and standard deviations of scores for each age group on each HBRI scale.

Table 5.5
Age Group Frequencies

	Frequency	Cumulative Frequency	Percent	Cumulative Percent
Age < 40	1600	1600	64.4	64.4
Age => 40	648	2248	26.1	90.5
Missing	236	2484	9.5	100.0

Table 5.6
Means and Standard Deviations on the HBRI Scales for Each Age Group

	Age < 40 Mean	Age => 40 Mean	Mean Score Difference	Age < 40 Std Deviation	Age => 40 Std Deviation
Tactical	7.15	7.58	0.43	2.23	1.78
Strategic	5.32	5.50	0.18	2.30	2.32
Total	12.47	13.08	0.61	4.04	3.64

Then, for each HBRI-1 scale, we calculate adverse impact with the older normative age group used as the reference group, as the correlations are positive between age and HBRI Tactical, Strategic, and Total scores, at .16, .10, and .14 respectively. Once again, we calculate adverse impact at each score level on each HBRI scale, and present the resulting ratios in graph form in Figure 9. This time, we plot all three scales onto the same graph.

What we see is that there is effectively no substantive adverse impact due to the age of a candidate, given the current normative dataset and ethnic group samples acquired to date. Thus, these data can be used as an initial evidence-base to support a proposition that the three HBRI scales show no adverse impact, defined by the Uniform Guidelines four-fifths or 80% rule-of-thumb, with regard to gender.

6. Test Administration

6.1 Administration

The validity and generalizability of HBRI results are influenced by the procedures and conditions under which the HBRI is administered. The Principles for the Validation and Use of Personnel Selection Procedures (Society for Industrial and Organizational Psychology, 2003) note that violating standardized administration protocols may compromise the generalizability of assessment results. Given the importance of standardized administration, this section outlines the basic procedures which must be upheld when administering the HBRI. Every organization that uses the test has unique factors that will impact the administration, but the practices outlined in this section constitute the minimum standards to be upheld across all organizations.

The HBRI is available in web-based administration format only. Web-based administration is the most expedient and efficient mode of assessment. Responses are automatically transmitted to Hogan's secure server; results are immediately calculated and reported almost instantaneously.

Ideally the test should be administered in a proctored situation so that the validity of the respondent data might be better assured. In addition, the proctors must be suitably trained in psychological test administration. This latter recommendation is very important as proctoring requires adherence to common best-practice standards of administration which seek to standardize the test-taking experience for all candidates undertaking the HBRI and perhaps other associated psychological tests. Hogan Assessment Systems strongly advocate proctoring and the use of trained proctors. However, we are also sensitive to the fact that there are applications or clients for whom proctoring is either physically impossible, undesirable, or might simply be considered unnecessary (as in an in-house employee development/training scenario).

For example, when the test is used for incumbent employee personal development purposes, a client might have their own junior executives complete the test at their home or in their own office - prior to holding a personal development meeting or training session. Likewise, senior executive assessment as part of a selection process might be more conveniently achieved if the executive is allowed to complete the test at a location and time of their choosing.

However, when the test is administered unproctored, Hogan Assessment Systems can no longer provide any assurances as to the validity of the data provided by candidates or test-takers. That is, we or the client have no way of knowing whether the data and results for a particular test-taker are theirs alone, and free from aids and devices used to enhance their test score.

Because the HBRI is a reasoning test, it has right and wrong answers. This makes the test susceptible to cheating. Clearly, administering the HBRI in a proctored setting will help prevent cheating in two important ways. First, the presence of a proctor monitoring the HBRI session will make it impossible for examinees

to cheat off of another examinee, to collaborate on items, and to use “cheat sheets” that provide correct answers to the items. Second, the proctor will ensure that no HBRI materials leave the assessment center guaranteeing that the integrity of the test is preserved.

Whether proctored or unproctored, the HBRI should be administered in an environment conducive to test taking. The test center or location/room should be free from distractions, adequately lit, kept at a comfortable temperature, and quiet. The inventory taker should be allotted or provide themselves sufficient space to work out problems on scratch paper. In a proctored situation, the test center should also include a clock(s) that is visible from all work stations in the room, allowing inventory takers to track their progress. In an unproctored situation, the test-taker should have access to their own clock or watch.

Items prohibited during HBRI administration

These include calculators, dictionaries, any computer programs not directly used to administer the assessment (e.g., Excel or Word), cellular telephones (especially camera-phones), and tape recorders. All items on this list can be used either to increase one’s score or copy materials for distribution to unauthorized persons. Obviously, in an unproctored testing situation, one must trust the candidate to follow these instructions.

One other concern that has arisen recently is the use of external internet calculators and information tools by a candidate, during the administration session itself. Because the HBRI is being administered via the web, it is possible for a candidate to access other websites that might provide an advantage to their performance on certain items. We recommend that candidates are clearly informed that such activity might lead to their test results being deemed invalid. Again, in an unproctored testing situation, one must trust the candidate to follow these instructions.

6.2 Computer Administrator Instructions

Before the HBRI can be administered by computer, certain requirements must be assessed. Hogan uses a web-based application for assessment delivery. This web application resides on the Hogan server and runs in a standard web browser. The delivery of the HBRI requires no download or installation. To use the application successfully, however, the assessment administrator must ensure his or her systems meet certain requirements before beginning any HBRI assessment session. The general system requirements are as follows:

Hardware Requirements

1. Internet connection, minimum 56.6k modem (T1, Cable modem or DSL recommended).
2. Monitor resolution must be at least 800 by 600 pixels (1024 by 768 recommended).
3. Any firewall or virus protection software may block the assessment. This is a matter for IT system administrators to determine, as workarounds do exist if this is the case.

Browser Requirements

1. Netscape or Microsoft Internet Explorer (versions 5 or newer).
2. HAS requires the browser accept cookies.

This list is intended as a general guide. Assessment administrators are responsible for quality assurance at their test center before HBRI administration commences.

On a workstation suitable for administering the HBRI, open the appropriate web browser and direct each workstation to the HBRI login website. As examinees arrive, hand out scratch paper, two writing utensils, and the examinee's user ID and password for the website. Have the examinees enter their user ID and password and follow the on-screen instructions. Instruct the examinees to stop once they reach the instructions page. Once all examinees reach the instructions read the following passage aloud to them:

“There are 24 questions on this inventory. The test is not timed, but most people are expected to complete the test within 30 minutes or so. Please work quickly and do not spend too much time on one question. There are three or four possible answers to each question. Please choose the answer that you feel best answers the question. Select the answer you have chosen by clicking on the corresponding circle with your mouse. Once you have selected your answer choice, click next to move onto the next question. Once you have moved onto a new question, you will not be able to go back and change your answers, so be sure that you have selected the answer choice before clicking ‘next’.

You may not use any outside materials while completing this test including calculators, dictionaries, or any software applications on this computer. You may use scratch paper while completing this test.”

Once the instructions are complete, the administrator should ask if there are any questions. When examinee(s) are ready, tell them to begin. After 45 minutes, it is advisable to inform the remaining test-takers that they should be trying to finish. It is important to note examinee(s) are not permitted to have other software applications running during their HBRI session.

6.3 HBRI Taker Accommodations

Reasonable accommodations can be made for examinees with documented special needs in compliance with the Americans with Disabilities Act. Examples of reasonable accommodations include extended time limits and enlarged print size. All requests for modifications should be handled by the user on a case by case basis.

Overall, the administration of the HBRI is a simple procedure and successful sessions can easily be achieved by following these basic guidelines. Hogan's customer service team is available to answer questions or respond to any concerns regarding HBRI administration.

6.4 HBRI Research Opportunities

Opportunities exist for organizations to collaborate with Hogan Assessment Systems on HBRI norming sample data collections and criterion-related research. Organizations will gain valuable feedback about their workforce while working with our psychometric experts to conduct cutting-edge research.

Of especial interest and relevance is prediction-focused work which looks at the predictive accuracy of the HBRI and personality variables using job-related performance variables as outcome criteria. These criteria may be drawn from an organization's own performance metrics systems in conjunction with the systematic performance-related job characteristic variables identified using the Hogan Job Evaluation Tool (JET). This tool is designed to identify personal characteristics and competencies required by jobs. Different jobs require different personality characteristics, work preferences, and competencies for successful performance. The JET provides a systematic way for job experts to describe a job and to compare it to other jobs. Results from the JET are conventionally used for a variety of human resource purposes including identifying job-related assessments, matching people to jobs and work groups, and defining characteristics needed for jobs of the future. With respect to HBRI criterion prediction, it is possible to use the results of a JET evaluation, along with organizational performance metrics, to develop meaningful outcome criteria for which the HBRI scales alone might be predictive.

Any organization with business-related professional, or management-level employees may be qualified to participate in HBRI research. For more information, contact the Hogan Assessment Systems Research Department by email to research&development@hoganassessments.com, or visit our web site, www.hoganassessments.com.

7. References

- Arvey R. D., & Faley R. H. (1988). *Fairness in selecting employees* (2nd ed.). Reading, MA: Addison-Wesley.
- Barrett, P. T. (2003). Beyond psychometrics: measurement, non-quantitative structure, and applied numerics. *Journal of Managerial Psychology*, 18, 421-439.
- Binet, A. (1903). *L'etude experimentale de l'intelligence*. Paris: Schleicher Freres & Cie.
- Brand, C. R. (1994). Open to experience—closed to intelligence: Why the “Big Five” are really the “Comprehensive Six.” *European Journal of Personality*, 8, 299-310.
- Cattell, R. B., Eber, H. W., & Tatsuoka, N. M. (1970). *Handbook for the 16 Personality Factor Questionnaire (16PF)*. Champaign, IL: Institute for Personality and Ability Testing.
- Chamorro-Premuzic, T., & Furnham, A. (2005). *Personality and intellectual competence*. Mahwah, NJ: Lawrence Erlbaum Associates.
- De Raad, B., & Perugini, M. (Eds.). (2002). *Big Five assessment*. Seattle, WA: Hogrefe & Huber.
- Drucker, P. F. (2006). *What executives should remember*. Harvard Business Review, February, pp. 145-152.
- Dudek, F. J. (1979). The continuing misinterpretation of the standard error of measurement. *Psychological Bulletin*, 86, 335-337.
- Equal Employment Opportunity Commission, Civil Service Commission, Department of Labor, & Department of Justice. (1978). Uniform guidelines on employee selection procedures (UGESP). *Federal Register*, 43, 38290-38315.
- Hogan, R., & Hogan, J. (1995). *Hogan Personality Inventory manual* (2nd ed.). Tulsa, OK: Hogan Assessment Systems.
- Hogan, R., & Hogan, J. (1997). *Hogan Development Survey manual*. Tulsa, OK: Hogan Assessment Systems.
- Hogan, R., & Hogan, J. (2007). *Hogan Personality Inventory manual* (3rd ed.). Tulsa, OK: Hogan Assessment Systems.

- Hogan, R. (1983). A socioanalytic theory of personality. In M. Page (Ed.), *1982 Nebraska Symposium on Motivation* (pp. 55-89). Lincoln: University of Nebraska Press.
- Menkes, J. (2005). *Executive intelligence*. New York: HarperCollins.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- Poole, D., Mackworth, A., & Goebel, R. (1998). *Computational intelligence: A logical approach*. Oxford, UK: Oxford University Press.
- Sedikides, C., & Skowronski, J. J. (1997). The symbolic self in evolutionary context. *Personality and Social Psychology Review*, 1, 80-102.
- Segall, D. O., & Monzon, R. I. (1995). *Equating Forms E and F of the P & GATB* (Tech. Report). San Diego, CA: Navy Personnel Research and Development Center.
- Sneath, P. H. A., & Sokal, R. R. (1973). *Numerical taxonomy: The principles and practice of numerical classification*. San Francisco: W.H. Freeman.
- Spearman, C. (1927). *The nature of intelligence and the principles of cognition* (2nd ed.). London: MacMillan.
- Watson, G., & Glaser, E. M. (2002). *Watson-Glaser Critical Thinking Appraisal manual*. San Antonio, TX: Harcourt Assessments.

A.1 Appendix

Sample Item 1

Shipment A weighs 87 pounds. Shipment B is 215 pounds. Shipment C is 111 pounds. Two of them together on the same scale could not weigh:

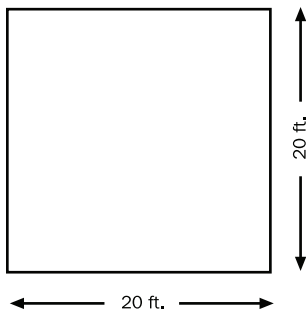
- a) 302 pounds
- b) 326 pounds
- c) 313 pounds
- d) 198 pounds

Sample Item 2

A low priority is to urgency as a small budget is to _____.

- a) low spending
- b) high spending
- c) small payments

Sample Item 3

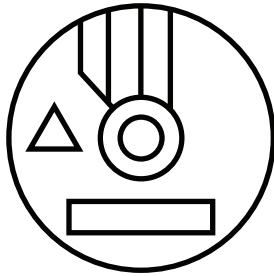


If the walls of the space are 8 feet tall, how many square feet of wall paper would be needed for the four outer walls?

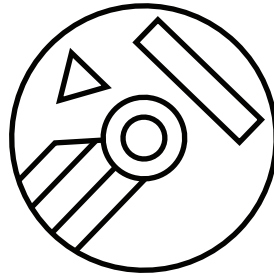
- a) Approximately 480 square feet
- b) Approximately 720 square feet
- c) Approximately 640 square feet
- d) Approximately 560 square feet

Sample Item 4

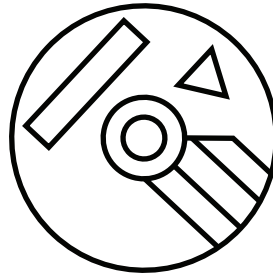
Which of these computer parts is **not** a clockwise rotation of the original?



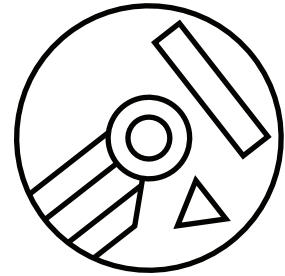
Original



a)



b)



c)

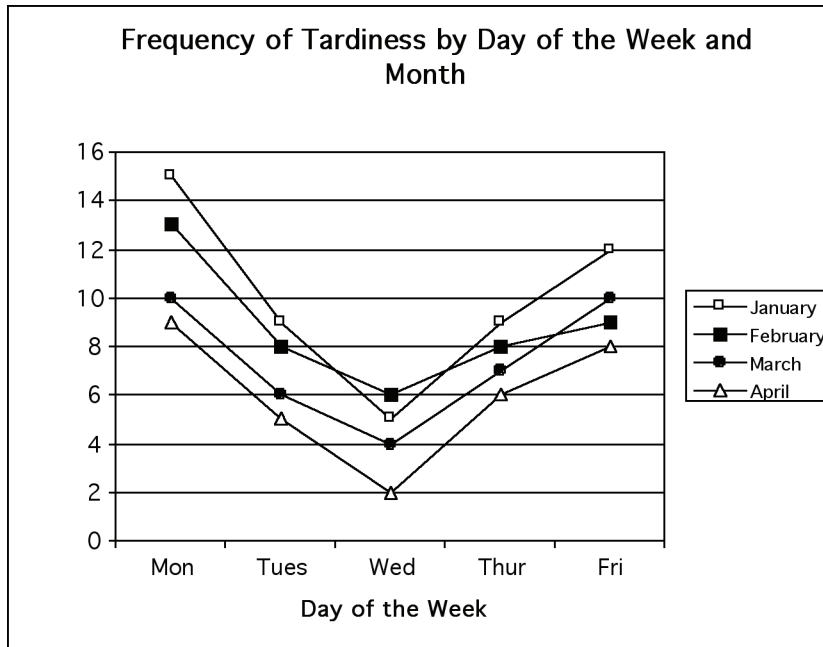
Sample Item 5

Average Monthly Performance			
	Sales Generated	Accounts Established	Accounts Lost
Employee A	\$12,892	14	2
Employee B	\$18,497	20	0
Employee C	\$13,239	15	2
Employee D	\$10,578	10	4
Employee E	\$16,653	18	3

As a supervisor, you decide to rank employees based on performance. You rank Employee C over Employee E. What is the basis of your decision?

- a) Employee C has a greater ratio of Sales Generated to Accounts Established
- b) Employee C has a relatively stable monthly performance
- c) Employee E generates more sales
- d) Employee E loses more accounts than Employee C

Sample Item 6



Company policy focuses on reducing tardiness on Fridays. What is the biggest problem with this policy?

- a) Biggest tardiness problem occurs on Wednesdays
- b) Biggest tardiness problem occurs on Mondays
- c) Tardiness is constant across all days of the week
- d) There is no problem with this policy



HOGANPRESS

www.hoganpress.com

ISBN: 978-0-9840969-3-0



9 780984 096930

5 4 5 0 0