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TECHNICAL MANUAL

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EXECUTIVE SUMMARY

This document reviews the validity of personality measures for selecting employees in the following seven job families: Managers & Executives, Professionals, Technicians & Specialists, Sales & Customer Support, Administrative & Clerical, Operations & Trades, and Service & Support. The report reviews the procedures used to evaluate the validity of personality measures for predicting job performance within each family. These methods included three types of validity generalization: meta-analysis, transportability, and synthetic/job component validity.

Specifically, validity generalization methods are used to identify scales from the Hogan Personality Inventory *(HPI; R. Hogan & Hogan, 1995, 2007)* that are significantly correlated with performance across and within seven job families.

According to the *Uniform Guidelines on Employee Selection Procedures*, when jobs are similar and the selection procedures are valid and fair, test validity from one job can be used for decision-making in similar jobs. For each of the seven job families, transportability of validity evidence is based on data from multiple jobs in the Hogan Archive; job similarity was determined using job descriptions, previous job analysis information, and Department of Labor and Occupational Information Network job codes. The original validation studies provide the predictor-criterion relations necessary to transport the HPI scales for future selection. Results from archival studies reveal that cutoff scores for the HPI can be used to predict performance for each job family and will yield no adverse impact.

Synthetic/job component validity involves: (a) defining critical job components or competencies for each job family through a review of job analysis information; (b) identifying valid predictors of those job components within archival studies; and (c) applying the results to the same components in each of the seven job families. Synthetic/job component validity evidence is an additional justification for using designated HPI scales as a selection battery to predict job components required in each job family.

Based on the job analysis results and validity generalization evidence, Hogan recommends a profile of HPI scale scores for personnel selection in each job family. Simulations using an archival applicant pool indicate that the recommended cutoff scores are fair and should not result in adverse impact.

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1. INTRODUCTION

Hogan Assessment Systems (Hogan) is the publisher of personality assessments that evaluate a candidate's fit with a job. Hogan provides comprehensive employee selection and development systems for customers throughout the United States and around the world. Hogan is the industry leader for real time personality assessment and reporting.

This report presents a technical summary of research evaluating the validity of the Hogan Personality Inventory (HPI) for selecting individuals into seven job families: Managers & Executives, Professionals, Technicians & Specialists, Operations & Trades, Sales & Customer Support, Administrative & Clerical, and Service & Support. Based on over two decades of research on the validity of personality scales for predicting job performance across jobs and organizations, Hogan has identified profiles that can inform the selection of high potential individuals for all major job families in mid-sized organizations.

The research presented in this report conforms to the standards of the *Uniform Guidelines on Employee Selection Procedures* *(Equal Employment Opportunity Commission, Civil Service Commission, Department of Labor, & Department of Justice, 1978; hereafter "Uniform Guidelines")* and *The Principles for the Validation and Use of Personnel Selection Procedures* *(Society for Industrial and Organizational Psychology, 2003; hereafter "Principles")*. In areas where the *Uniform Guidelines* and/or *Principles* lack specificity, the research approach relies on the broader scientific/professional literature for guidance.

1.1 Overview

The research by Hogan sought to identify valid personality measures useful for predicting performance in jobs within each of seven job families. This document is organized around Section 15 of the *Uniform Guidelines* and technical information is contained in the following sections:

- *Introduction* – a brief overview of the job families research project
- *Description of Predictors* – a history and review of the HPI
- *Inventory Construction, Reliability, and Confirmation* – psychometric information
- *Generalizing Validity Evidence from the Five-Factor Model and the HP*I – a review of meta-analysis literature
- *Validity Generalization Results for Job Families* – a review of evidence supporting the use of the HPI for seven job families
- *Norms, Uses, and Applications* – describes the normative percentile scoring system and application of the selection procedure

1.2 User, Location(s), and Dates of Study

Hogan initiated efforts to identify valid scales and standardized cutoff scores for the HPI's use with job families in April 2004. Hogan finalized job family descriptions in June 2004, and completed the validity generalization procedures outlined in this report, along with final cutoff score recommendations in March 2006. All validation research contained in the Hogan archives that is used for this study was conducted in the United States between 1982 and 2005.

1.3 Problem and Setting

A review of the Hogan job families indicates personality measures would be useful additions as predictors of job performance. The problem is to identify valid personality profiles specifically for seven job families that are appropriate for personnel selection. The desired selection components include: (a) reliable measurement [personality scales show internal item consistency and stability over time]; (b) evidence that personality scores predict meaningful non-test behavior, documented in credible sources; (c) personality scales that predict relevant job component criteria; and (d) personality measurement that does not discriminate unfairly on the basis of age, gender, or race/ethnicity.

Hogan evaluated the validity of the HPI *(R. Hogan & Hogan, 1995, 2007)* for performance prediction in each job family based on evidence that personality measures predict critical competencies for these jobs *(Hogan & Holland, 2003*). The research setting to access technical validation studies was the Hogan archives and the HPI data warehouse. Prior to 2001, HPI data in the archive were machine scored using computerized scoring software. In May 2001, HPI data collection began using the Web-based Assessment Management (WAM) system, which produces a scored database from internet administration of the HPI. WAM's successor is HALO, Hogan Assessments Link Online, which is a secure online platform for administering assessments and managing client applications. For the current application, no previous selection procedures or cutoff scores were specified by Hogan.

The scope of the research is defined by the job families. The personality assessments specified for each job family are intended to be used with candidates who apply for jobs classified within a job family. No assessment distinctions are made for the variety of jobs included in a job family. This is a limitation of the research because subtle differences between jobs within a family are not reflected in the selection system. Hogan recommends local validation, where feasible, to specify more precise selection solutions for use in individual jobs.

1.4 Job Families

Job families are groups of occupations classified as similar based on work performed, skills, education, training, and credentials required for competence. The seven job families identified for this project were derived by Hogan from nine "job classifications" used by the Equal Employment Opportunity Commission (EEO) for employers in the United States. These nine EEO job classifications capture information to tabulate an organization's ethnic make-up. This scheme is used by Hogan for two reasons: (a) a large percentage of employers within the United States are familiar with the EEO job classifications; and (b) the job classifications are conceptually clear and easy to use for reporting purposes.

Based on prior experience with competencies, Hogan determined that the same competency models could be used for the original EEO job classifications of Craft Worker, Operative, and Laborer. Each of these job classifications are combined into the Operations & Trades job family used for this project. Hogan made additional modifications to job family names for the purpose of creating a less bureaucratic, more inclusive scheme of titles.

Table 1.1 presents the seven job families along with the Hogan descriptions of those families, the US Department of Labor (DoL) classifications *(US DoL, 2001)*, and the corresponding Occupational Information Network *(O*NET OnLine, 2005)* job categories. The DoL Standard Occupational Classification (SOC) System was developed by the US DoL in response to a growing need for a universal occupational classification system *(US DoL, 1991)*. The SOC System contains 22 occupational categories that are used to classify all jobs within the US workforce. The O*NET is the product of a large-scale effort to transfer SOC information to a searchable, web-based platform *(Dye & Silver, 1999)*. For determining jobs within families, Tables A.1 though A.7 in Appendix A present O*NET job titles classified by job family. For further guidance on selecting the appropriate job family for a given job, see Appendix B.

Table 1.1

US Department of Labor Job Categories and SOC Codes Categorized by Job Family

Job Families	Definitions	O*NET & SOC Job Categories
Managers & Executives	Employees assigned to positions of administrative or managerial authority over the human, physical, and financial resources of the organization.	Management
Professionals	Employees with little legitimate authority, but high status within the organization because of the knowledge and/or skills they possess. These employees usually are experts with a broad educational background and rely primarily on their knowledge and intellect to perform their duties.	Architecture and Engineering
		Art, Design, Entertainment, Sports, and Media
		Business and Financial Operations
		Community and Social Service
		Education, Training, and Library
		Health Practitioner and Technical
		Legal
		Life, Physical, and Social Science
Technicians & Specialists	Employees who rely on the application of highly specific knowledge in skilled manipulation (e.g., operation, repair, cleaning, and/or preparation) of specialized technology, tools, and/or machinery. Computer and Mathematical Science	Installation, Maintenance, and Repair
Operations & Trades	Craft workers (skilled), operatives (semi-skilled), and laborers (unskilled) whose job knowledge and skills are primarily gained through on-the-job training and experience; little prerequisite knowledge or skill is needed.	Building and Grounds Cleaning and Maintenance
		Construction and Extraction
		Farming, Fishing, and Forestry
		Military Specific Production
		Transportation and Material Moving
Sales & Customer Support	Employees who use appropriate interpersonal style and communication techniques to establish relationships, sell products or services that fulfill customers' needs, and provide courteous and helpful service to customers after the sale.	Sales and Related
Administrative & Clerical	Employees who plan, direct, or coordinate supportive services of an organization. The main function of these employees is to facilitate the function of professionals by completing jobs that require little formal education or skill to complete (e.g., professional assistants, secretaries, and clerks).	Healthcare Support
		Office and Administrative Support
Service & Support	Employees that perform protective services for individuals and communities (e.g., police, fire fighters, guards) and non-protective services for individuals that require little to no formal training but a high degree of interaction with people (e.g., food service, recreation and amusement).	Food Preparation and Serving Related
		Personal Care and Service
		Protective Service

2 - DESCRIPTION OF PREDICTORS

2.1 Approach and Rationale

Validating selection instruments relies on accurate measurement. Measurement can be defined as any procedure that assigns numbers systematically to characteristic features of people according to explicit rules (*Ghiselli, Campbell, & Zedeck, 1981)*. These numbers are used to make predictions or forecast future behavior(s).

Assigning numbers to characteristics is a critical, but not sufficient, requirement of any pre-employment selection tool. Every selection tool should have available evidence to support: (a) the reliability of the instrument; and (b) the relations between scores on the instrument and job-relevant behaviors or outcomes *(Equal Employment Opportunity Commission, et al., 1978)*. At a minimum, the reliability of pre-employment assessments should be evaluated in terms of the degree to which: (a) items or questions on a scale relate to one another (internal item consistency); and (b) results or scores remain stable over time (test-retest reliability).

The ability of a pre-employment instrument to predict job-relevant outcomes should be available in credible scientific sources. The supporting evidence should include significant and interpretable relations between scores on the pre-employment instrument and indices of job performance. Moreover, evidence should also demonstrate that scores on the pre-employment instrument predict job performance criteria critical to success in the job of interest, rather than an ability to predict performance outcomes that are unrelated to critical work or behaviors.

Pre-employment instruments should not discriminate unfairly on the basis of age, gender, or race/ethnicity *(Equal Employment Opportunity Commission, et al., 1978)*. Selection procedures that result in adverse impact must be validated in accordance with the *Uniform Guidelines*. Unfortunately, many instruments currently used in pre-employment screening processes fail to meet the criteria outlined above *(R. Hogan, Hogan, & Trickey, 1999)*.

2.2 What to Measure and Why

Based on Hogan's goal to evaluate the validity of personality measures for each job family, the following summarizes the measurement issues that influence personality assessment. The most important question is "*What should we measure?*" Historically, the answer depended on a test author's personal interests *(e.g., Locus of Control; Rotter, 1966)*, practical concerns *(e.g., Minnesota Multiphasic Personality Inventory; Hathaway & McKinley, 1943)*, or theory *(e.g., Myers-Briggs Type Indicator®; Myers, McCaulley, Quenk, & Hammer, 1998; Thematic Apperception Test; Morgan & Murray, 1935)*. Multi-dimensional personality inventories developed during the 1940s and 1950s measured traits *(cf. Allport, 1937)*. Early approaches to personality inventory construction led to more

advanced test development strategies and improved the quality and interpretability of the instruments. Current thinking in personality assessment converges on the idea that most personality characteristics can be described in terms of five personality dimensions. The Five-Factor Model *(FFM; cf. De Raad & Perugini, 2002; Digman, 1990; Goldberg, 1992; John, 1990, p. 72; McCrae & Costa, 1987)*, which emerged from fifty years of factor analytic research on the structure of observer ratings *(cf. Norman, 1963; Thurstone, 1934; Tupes & Christal, 1961)*, suggests that we think about and describe others and ourselves *(Goldberg, 1990)* in terms of five themes:

I. ***Surgency/Extraversion*** - the degree to which a person is outgoing and talkative.
II. ***Agreeableness*** - the degree to which a person is rewarding to deal with and pleasant.
III. ***Conscientiousness*** - the degree to which a person complies with rules, norms, and standards.
IV. ***Emotional Stability*** - the degree to which a person appears calm and self-accepting.
V. ***Intellect/Openness to Experience*** - the degree to which a person seems creative and open-minded.

The FFM was the starting point for several personality inventories constructed over the last twenty years *(e.g., NEO-PI: Costa & McCrae, 1985; HPI: R. Hogan & Hogan, 1995, 2007; Personal Characteristics Inventory: Mount & Barrick, 2001)*. The five dimensions provide a useful taxonomy for classifying individual differences in social behavior (i.e., reputation). Evidence suggests that all existing multidimensional personality inventories map these five dimensions to a greater or lesser extent *(De Raad & Perugini, 2002; Wiggins & Pincus, 1992)*. Consequently, the FFM is the paradigm for current research in personality assessment *(De Raad & Perugini, 2002; R. Hogan & Hogan, 1995, 2007)*.

The FFM is based on observers' descriptions of others, which form the basis for one's reputation – i.e., how people describe coworkers or peers *(Hogan, 1983)*. Reputations grow from social consensus regarding consistencies in a person's behavior, and develop from behavior during social and occupational interaction. These behaviors consist, at least in part, of actions designed to establish, defend, or enhance that person's identity – i.e., a person's view of him or herself *(cf. Goffman, 1958)*. Reputations are public, tell us about observable tendencies in the others' behaviors, can be measured reliably, and can be used to forecast future behavior *(cf. Emler, 1990; Ozer & Benet-Martinez, 2006)*. A person's reputation represents an invaluable source of information about work-related strengths and shortcomings, and it also influences the direction of careers.

Personality assessment samples self-presentational behavior – i.e., how a person portrays him or herself to others on the job. An assessment instrument allows us to aggregate these behavioral samples, assign them numbers according to certain agreed-upon rules, and then use these numbers or scores to make predictions about a person's future behavior.

2.3 The Hogan Personality Inventory

The HPI was the first measure of normal personality developed explicitly to assess the FFM in occupational settings. The measurement goal of the HPI is to predict real-world outcomes. As such, it is an original and well-known measure of the FFM and is considered a marker instrument, not only in English, but for personality measures in other languages as well. Tables 2.1 through 2.4 present correlations between the HPI and other FFM assessments. Figure 2.1 shows median correlation coefficients that summarize HPI relations with Goldberg's *(1992)* Big-Five Markers *(R. Hogan & Hogan, 1995)*, the Personal Characteristics Inventory *(Mount & Barrick, 2001)*, the Inventario de Personalidad de Cinco Factores (*Salgado & Moscoso, 1999)*, and the NEO PI-R *(Goldberg, 2000)*. Correlations range as follows: Adjustment/EmotionalStability/Neuroticism (.66 to .81); Ambition/Extraversion/Surgency (.39 to .60) Sociability/Extraversion/Surgency (.44 to .64); Interpersonal Sensitivity/Agreeableness (.22 to .61); Prudence/Conscientiousness (.36 to .59) Inquisitive/Openness/Intellect (.33 to .69); and Learning Approach/Openness/Intellect (.05 to .35).

Table 2.1
Correlations Between Goldberg's Big-Five Markers and the HPI Scales

Scale	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Factor I - Surgency	.04	.55**	-.03	.31***	-.24**	.44***	.29***
Factor II - Agreeableness	.13	-.11	-.17*	.56***	.23**	.02	-.12
Factor III - Conscientiousness	.10	.24**	-.08	-.07	.36***	-.26***	-.17*
Factor IV - Emotional Stability	.70***	.39***	.11	.27***	.01	-.04	.28***
Factor V – Intellect	.05	.22**	.35***	-.01	.03	-.04	.33***

Note. N = 168. Table taken from the HPI Manual (R. Hogan & Hogan, 1995); ADJ = Adjustment; AMB = Ambition; INQ = Inquisitive; INP = Interpersonal Sensitivity; PRU = Prudence; LRN = Learning Approach; SOC = Sociability. *p < .05 ** p < .01 ***p < .001, one-tailed; directional relationships hypothesized a priori.

Table 2.2
Correlations Between the PCI Primary Scales and the HPI Scales

Scale	ADJ	AMB	SOC	INP	PRU	INQ
Extraversion	.04	.39*	.64*	.26*	-.09	.18
Agreeableness	.50*	.25*	.09	.61	.21	-.03
Conscientiousness	.24*	.39*	-.06	.17	.59*	.08
Stability	.69*	.59*	-.02	.46*	.25*	.06
Openness	.12	.36*	.15	.17	-.05	.57*

Note. N = 154; ADJ = Adjustment; AMB = Ambition; INQ = Inquisitive; INP = Interpersonal Sensitivity; PRU = Prudence; SOC = Sociability. *p < .01.

Table 2.3
Correlations Between the Inventario de Personalidad de Cinco Factores (IP/5F) and the HPI Scale

Scale	ADJ	AMB	SOC	INP	PRU	INQ
Extraversion	.24	.60	.62	.35	.04	.41
Agreeableness	.22	-.12	-.10	.37	.25	-.10
Conscientiousness	.22	.35	.08	.30	.49	.19
Stability	-.66	-.50	-.16	-.31	-.32	-.26
Openness	.11	.44	.51	.25	-.15	.69

Note. N = 200; Critical probability values were not provided in the study. ADJ = Adjustment; AMB = Ambition; INQ = Inquisitive; INP = Interpersonal Sensitivity; PRU = Prudence; SOC = Sociability.

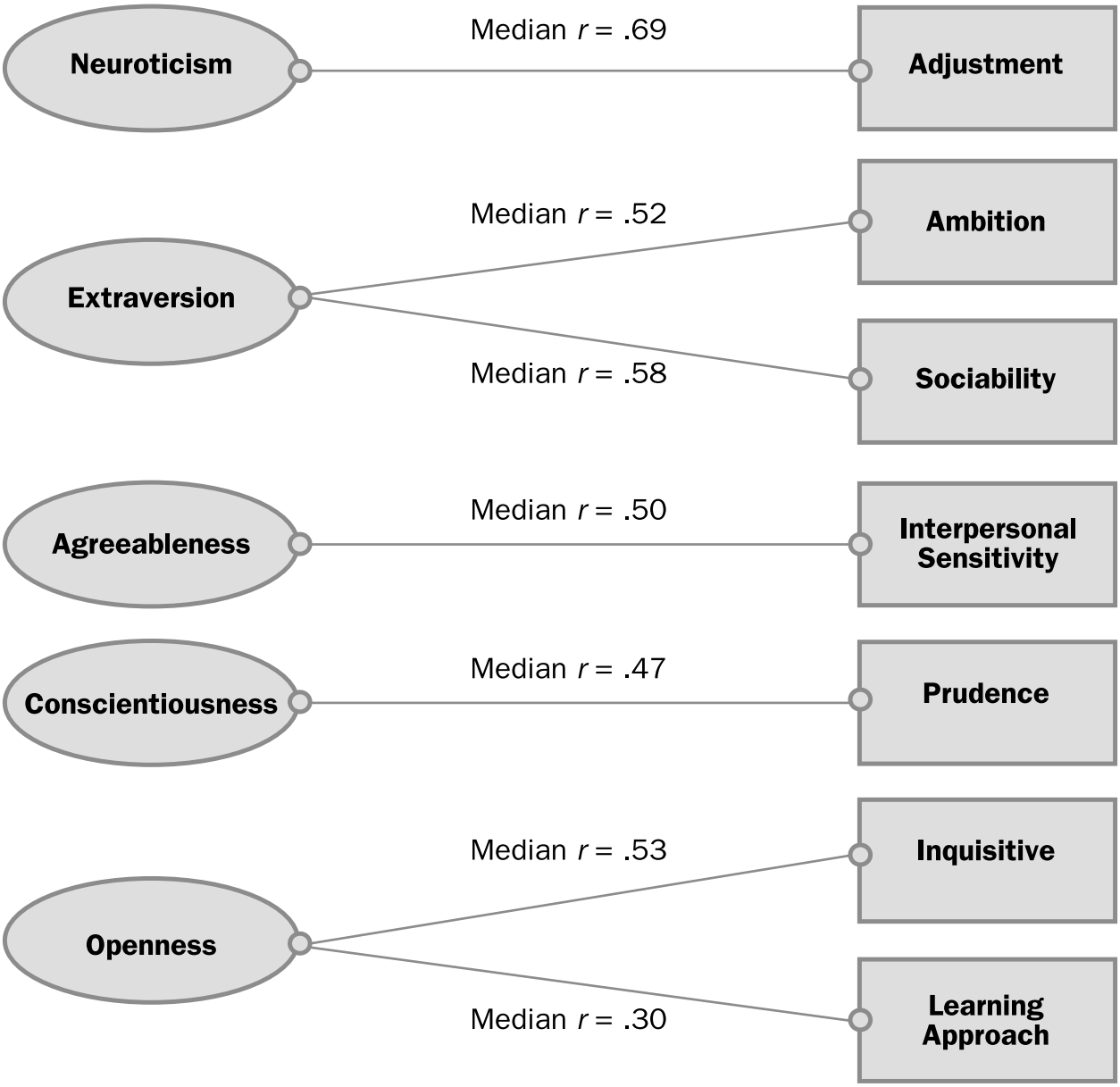
Table 2.4

Correlations Between the NEO-PI-R and the HPI Scales

Scale	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Extraversion	.16**	.54**	.63**	.44**	-.06	.22**	.08*
Agreeableness	.31**	-.12**	-.24**	.47**	.46**	-.20**	-.08*
Conscientiousness	.24**	.37**	-.05	.08	.42**	.05	.16**
Neuroticism	-.72**	-.53**	-.08*	-.27**	-.22**	-.15**	-.17**
Openness	.01	.20**	.38**	.19**	-.31**	.52**	.24**

Note. N = 679; ADJ = Adjustment; AMB = Ambition; INQ = Inquisitive; INP = Interpersonal Sensitivity; PRU = Prudence; LRN = Learning Approach; SOC = Sociability. *p < .05 ** p < .01, two-tailed; directional relationships not hypothesized a priori.

Figure 2.1
Relations Between FFM Inventories and Primary HPI Scales



Note. Median correlation coefficients summarize HPI relations with the NEO PI-R (Goldberg, 2000), Goldberg's (1992) Big-Five Markers (R. Hogan & Hogan, 1995), Personal Characteristics Inventory (Mount & Barrick, 2001), and the Inventario de Personalidad de Cinco Factores (Salgado & Moscoso, 1999). The coefficient ranges are as follows: Adjustment/Emotional Stability/Neuroticism (.66 to .72); Ambition/Extraversion/Surgency (.39 to .60); Sociability/Extraversion/Surgency (.44 to .64); Interpersonal Sensitivity/Agreeableness (.37 to .61); Prudence/Conscientiousness (.36 to .59); Inquisitive/Openness/Intellect (.33 to .69); Learning Approach/Openness/Intellect (.24 to .35).

2.4 Hogan Personality Inventory Test Description and Development

HPI Test Description

- 206 true/false items with no psychiatric content.
- 7 personality scales, 1 validity scale, no item overlap.
- 4.6 grade reading level.
- 15-20 minute completion time, for computerized and paper-and- pencil, respectively.
- Items carefully screened to minimize invasion of privacy.
- Designed for ages 18 and above.
- Designed for use in personnel selection and employee development.
- Internet administration and reporting.

HPI Test Development

- Development began in the late 1970's, based on the FFM, and constructed and validated in accordance with professional standards and the *Uniform Guidelines*. HPI reviews appear in the Buros Institute of Mental Measurements 13th edition of the *Mental Measurements Yearbook*.
- Norms are based on over 150,000 working adults and job applicants from a variety of organizations including healthcare, military services, transportation, protective services, retail, manufacturing, and hospitality. This sample is representative of 14 of the 23 US Department of Labor categories, or 84.4% of the 2005 US occupations *(US Department of Labor, 2006)*.
- The HPI has been used in over 200 validation studies to predict occupational performance across a range of jobs and industries. Jobs studied represent 95% of the industry coverage of the *Dictionary of Occupational Titles* *(US Department of Labor, 1991)*.
- Meta-analyses of HPI scales indicate that the estimated true validities for the HPI scales for predicting job performance are: Adjustment (.43), Ambition (.35), Interpersonal Sensitivity (.34), Prudence (.36), Inquisitive (.34), and Learning Approach (.25). These peer-reviewed results appear in the *Journal of Applied Psychology* *(Hogan & Holland, 2003)*.
- Research, to date, indicates no adverse impact by race/ethnicity or gender.
- The HPI incorporates the FFM with an internal factor structure supporting seven scales. The short-term test-retest reliabilities range from .69 to .87. The 2007 *Hogan Personality Inventory Manual* *(3rd ed.)* documents the background, development, and psychometric properties of the inventory.
- R. Hogan, Hogan, and Warrenfeltz *(2007)* provide an interpretive guide for applications of the HPI.

Constructs Measured

The HPI scales (and FFM constructs measured) are defined as follows:

The **Adjustment** scale reflects the degree to which a person appears calm and self-accepting or, conversely, moody and self-critical (FFM: Emotional Stability).

The **Ambition** scale evaluates the degree to which a person seems socially self-confident, leader-like, competitive, and energetic (FFM: Extraversion).

The **Sociability** scale assesses the degree to which a person seems to need and/or enjoy interaction with others (FFM: Extraversion).

The **Interpersonal Sensitivity** scale measures the degree to which a person is seen as perceptive, tactful, and socially sensitive (FFM: Agreeableness).

The **Prudence** scale measures the degree to which a person seems conscientious, conforming, and dependable (FFM: Conscientiousness).

The **Inquisitive** scale reflects the degree to which a person is perceived as bright, creative, and interested in intellectual matters (FFM: Intellect/Openness).

The **Learning Approach** scale measures the degree to which a person seems to enjoy academic activities and to value education achievement for its own sake (FFM: Intellect/Openness).

In terms of instrument development, an initial pool of 425 items was refined using factor analysis and empirical validation procedures to assign 206 items to seven construct scales. The items form small composites (i.e., facets) that represent themes within the larger constructs. The number of composites per scale ranges from four (Learning Approach) to eight (Adjustment). Overall, HPI scales demonstrate adequate psychometric qualities *(Lobello, 1996)*. Items retained in the final battery were selected based on their demonstrated ability to predict significant non-test behavior. There is no item overlap among the primary scales and the validity scale. Empirical validation research conducted over the last 20 years provides a firm understanding of construct validity and the nature and range of job performance prediction. The HPI is a well-validated instrument that predicts job performance across occupations and organizations *(Axford, 1996; Hogan & Holland, 2003)*.

The HPI is intended to be used with adults, not children nor adolescents. It is intended for a normal population, not clinical, psychiatric, nor psychopathological sample. Although the HPI is appropriate and used widely in occupational contexts for personnel selection and professional development, it also is

appropriate for use with adults in peer, family, community, and friendship relations research and counseling. The HPI is neither a medical examination, nor can it be used to evaluate medical conditions, mental illness, mental disabilities, or physical disabilities. In addition, unintended assessment uses would also include forecasting or evaluating neuropsychological behavior, suicidal thoughts/behavior, specific criminal actions, cognitive ability, cognitive deficits, dementia, non-verbal reasoning, academic skills, learning disabilities, visual/motor abilities, hyperactivity, perceptual abilities, and/or information obtained from polygraph/biofeedback instruments.

3. INVENTORY CONSTRUCTION, RELIABILITY, AND CONFIRMATION

3.1 Early Development

The original model for the HPI is the California Psychological Inventory *(CPI; Gough, 1975)*. We worked with the CPI for over 25 years because we agree with its measurement goals. In brief, the CPI is designed to assess folk concepts aspects of social behavior that are cross-culturally significant and that non-psychologists intuitively understand. In addition, the CPI is not designed to measure traits. The most important feature of the CPI we believe, is that it is designed to predict important social outcomes; consequently, in the development of the CPI (and in the development of the HPI), formal psychometric considerations were used to facilitate prediction; they were not ends in themselves.

The HPI began in the late 1970's as a project in a graduate class in personality assessment. As noted in the previous chapter, the two fundamental questions in personality assessment concern what to measure and how to measure it. We believed the literature on the FFM provided an answer to the first question.

With regard to the second question, we believed that Hase and Goldberg *(1967)* were correct when they argued that there is little to choose among the various methods of scale construction as long as the end product is evaluated in terms of empirical validity. Similarly, Harrison Gough *(Gough, 1996)* believed firmly that the value of a scale is in its external predictions. We agree.

We suggested to our graduate class that, if the FFM is correct, and if the Hase and Goldberg argument is correct, then we have solid guidelines for constructing an inventory of normal personality; that is, we know what to measure and how to measure it. As for the test items themselves, socioanalytic theory provided a guide for item writing: taking each of the major dimensions of reputation in turn, one should ask what sorts of self-presentational behaviors might lead to high or low standing on that dimension–as evaluated by others. Consider Factor V of the FFM – Intellect/Openness to Experience. Persons with high scores on this factor seem bright, sophisticated, and aesthetically oriented. This suggests that an Intellect scale should contain items about the degree to which a person enjoys chess, opera, and trendy cuisine.

From a socioanalytic perspective, we wrote items to reflect the standard FFM dimensions *(cf. Goldberg, 1992)* using the foregoing algorithm. In the process, we made three discoveries. First, the standard FFM dimension called Surgency has two components that are conceptually unrelated. One component is Sociability, which concerns impulsivity and the need for social interaction–or a lack of shyness. The other component is Ambition, which concerns a desire for status, power, recognition, and achievement. Clearly, there are shy people who are ambitious — Warren Buffet – and sociable people who are lazy – Falstaff. Second, we found that the FFM dimension called Intellect/Openness to Experience has two components; one component concerns an interest in culture and ideas, and the other concerns interest in acquiring new knowledge. Our third discovery was that each of the primary scales breaks down into a group of related sub-

themes. For example, the Adjustment scale contains themes about worry, regret, complaints, patience, irritability, and so forth. Because the items in these sub-themes clustered together, we called them Homogenous Item Composites *(Zonderman, 1980)* or HICs.

We wrote items for HICs within each dimension, and pilot tested them using undergraduate samples. We retained items that correlated highly with the other items on a HIC and discarded items that did not. We continued this process until we arrived at a reasonably coherent set of 45 HICs containing 420 items distributed across six scales.

Between 1979 and 1984 we tested over 1700 people, including students, hospital workers, U. S. Navy enlisted personnel, clerical workers, truck drivers, sales representatives, police officers, hourly and professional staff in a large insurance corporation, school administrators, and incarcerated felons. These samples provided our initial database. In our view, every valid case was valuable. Test administration consisted of paper booklets of items and paper answer sheets. Items responses were entered by keyboard into a data file that was scored according to Fortran statements programmed into a mainframe computer.

3.2 Later Development

In the spring of 1984, with the assistance of Stephen R. Briggs, we carefully refined the internal consistency of each HIC. In the process, we shortened the inventory to 225 items on 43 HICs; we retained 85 unscored items for research purposes, so that the HPI paper test booklet contained 310 items.

Between 1984 and 1992 we tested over 11,000 people, primarily employed adults in organizations around the country. We conducted over 50 validity studies in various organizations and we gathered HPI matched sets of data with other tests, inventories, observer descriptions, and job performance criteria. During this time, we administered the assessments using paper booklets and optically scanned answer sheets. We developed PC-based software to score inventories locally and to archive the data files. One obvious limitation of PC-based software is the inability to accumulate data across users; we pursued our clients to share their data with us.

In the spring of 1992, using all our archival data, we conducted a number of factor analyses of the HIC correlation matrix; we concluded that there are seven factors underlying the matrix. These factors formed the basis of the present HPI scales. A few HICs had substantial loadings on two factors; we used this information to balance the number of items on each scale, i.e., if a HIC had nearly the same loading on two factors, and one scale was defined by fewer HICs than the other, we assigned the HIC to the smaller factor so as to balance the scale length. The 1992 HPI *(published in the R. Hogan and Hogan [1995] revised edition manual)* contains seven primary scales and a validity scale. These scales contain a total of 206 items arranged in 41 HICs. No items overlap on HICs and no HICs overlap on scales.

3.3 Most Recent Technical Developments

Over the last ten years, we focused on HPI validity research using the technical and methodological processes needed to promote evaluation of test validity. It seemed clear that we needed more work on personality-based job analysis and although we developed a methodology to evaluate personal requirements as "abilities" in the conventional KSA vernacular *(R. Hogan & Hogan, 1995, p. 75)*, we considered the possibility that a direct approach could be more efficient. We developed the Performance Improvement Characteristics (PIC) job analysis that asked subject matter experts to evaluate personality characteristics that improve performance in a job *(Hogan & Rybicki, 1998)*. Now, we have a reliable and valid job analysis tool for evaluating and documenting the personality-based requirements of jobs.

Similarly, we began paying attention to the criterion problem and tried to conceptualize performance data in terms of models that were consistent with socioanalytic theory. That is, if the veracity of motivational premises "getting along" and "getting ahead" is useful, then we ought to be able to recover and evaluate these themes in job performance. We developed the Competency Evaluation Tool (CET) as a performance taxonomy organized conceptually around socioanalytic theory and developmentally around the domain model of skills *(R. Hogan & Warrenfeltz, 2003; J. Hogan, Davies, & Hogan, 2007; Warrenfeltz, 1995)*. The CET is the basis for our validity generalization research and is an organizing feature of the HPI archives *(J. Hogan, Davies, & Hogan, 2007)*.

Also during this decade, we applied a systematic focus on local validation research. The technology solution relies on a web-based assessment platform that can be accessed from any device with an internet connection. The systems are monitored 24/7; the data are encrypted and stored on redundant servers ensuring high availability and reliability. The platform was designed with our clients' requirements in mind, providing flexible solutions and timely implementation, while maintaining the highest security. We built a data warehouse and a research archive on a foundation of criterion-related validity studies with the HPI as the primary predictor. We conducted over 200 empirical studies with client organizations across jobs that represent 95% of the US economy. These are both private and public sector organizations. Our database is almost exclusively samples of job applicants or working adults. Of those who are working, these individuals have completed tests either for selection research or for professional development. Internet online testing facilitated rapid accumulation of data and the ability to process validation studies efficiently.

With sufficient accumulated validity evidence for the HPI, we began aggregating results and generalizing validity inferences. We use the strategies of transportability of validity, synthetic/job component validity, and meta-analysis. In 2003, we published a comprehensive HPI-based meta-analysis, which showed that when predictors and criteria are aligned using socioanalytic theory, the meta-analytic validity exceeds that of atheoretical approaches *(J. Hogan & Holland, 2003)*. Subsequently, we published a demonstration project of validity generalization methods for personality measures *(J. Hogan, Davies, & Hogan, 2007)*. In this technical manual, we document the validity of the HPI for personnel selection into seven job families, which incorpo-

rates the O*NET job families as well as the Standard Occupational Classification system and the EEOC's job classifications. We attempt to provide a valid and fair selection solution with the HPI that can generalize to many jobs in the US economy.

In 2005, we updated the norms for the HPI. These now appear in this manual, along with the description of how the norming population was identified. The score distributions for all scales on the HPI have changed slightly since 1992. Specifically, the scale means increased over time, resulting in a somewhat skewed distribution of scores. Consequently, for clients who use the HPI for selection, cutoff scores based on the 1992 norms no longer result in the same pass rates that they did in earlier years. We believe that our 2005 norming process, based upon 156,614 respondent records, meets high professional standards and is representative of the US workforce. This sample was drawn from the Hogan Archive data warehouse consisting of adult employees or job applicants who completed the HPI during a two-year period prior to June 2005. Characteristics of the sample are provided in Chapter 6 and Appendix A.

3.4 Definitions of the Scales

The seven primary scales of the inventory are:

Adjustment, which measures the degree to which a person appears calm and self-accepting or, conversely, moody and self-critical.

Ambition, which measures the degree to which a person seems socially self-confident, leader-like, competitive, and energetic.

Sociability, which measures the degree to which a person seems to need and/or enjoy interaction with others.

Interpersonal Sensitivity, which measures the degree to which a person is seen as perceptive, tactful, and socially sensitive.

Prudence, which measures the degree to which a person seems conscientious, conforming, and dependable.

Inquisitive, which measures the degree to which a person is perceived as bright, creative, and interested in intellectual matters.

Learning Approach, which measures the degree to which a person seems to enjoy academic activities and to value educational achievement for its own sake.

In addition to the seven primary scales, the inventory contains a validity key. This scale, consisting of 14 items, is designed to detect careless or random responding. The scale was constructed rationally using items endorsed consistently "yes" or "no" by respondents (n = 1,700). For each validity item, 99% of the research sample answered the same way. Therefore, an incorrect response to one of these items is an infrequent occurrence; an incorrect response to nine of these items (validity cutoff score) would place a person in the 5.7th percentile of a large representative sample (N = 65,535). Slightly under two-thirds (64.3%) of this sample (N = 65,535) obtained a perfect score on this scale.

Overall, HPI scales demonstrate adequate psychometric qualities *(Lobello, 1996)*. Items retained in the final battery were selected based on their demonstrated ability to predict significant non-test behavior. There is no item overlap among the primary scales and the validity scale. Items were screened repeatedly for content that might seem offensive or to invade privacy. In 2005, 28 items were replaced with equivalent items based on client requests following the 2005 Karraker v. Rent-A-Center, Inc. Seventh U. S. Circuit Court of Appeals decision, which involved the inappropriate use of the MMPI. There are no items concerning sexual preference, religious beliefs, criminal offenses, drug and alcohol incidents, or racial/ethnic attitudes. Readability statistics conducted on the 206 items indicated an average sentence length of 8.3 words, an average word length of 4.1 letters, and an average of 1.44 syllables per word. The Flesch-Kincaid reading level analysis shows that the inventory is written at the 4.6 grade level. Finally, there are no items concerning physical or mental disabilities. Empirical validation research conducted over the last 20 years provides a firm understanding of construct validity and the nature and range of job performance prediction. The HPI is a well-validated instrument that predicts job performance across occupations and organizations *(Axford, 1996; J. Hogan & Holland, 2003)*.

3.5 Composition of the Personality Scales

The 1992 analyses that led to the seven HPI scales proceeded in several steps. First, we intercorrelated the scores on the original 43 HICs plus 8 experimental HICs using a sample of 2500 employed adults. An exploratory principal component factor analysis (PCA) was then undertaken. We chose the number of components to be extracted from the matrix based on the size of the eigenvalues, a scree test *(Cattell, 1966)*, and an examination of the comprehensiveness and comprehensibility of several alternative solutions. Finally, after deciding on the number of components to be extracted, we refined the components using orthogonal varimax rotation. R. Hogan and Hogan *(2007)* described the details of these analyses and results.

Table 3.1 presents the HPI scales, their constituent HICs, definitions of each HIC, and sample items. The largest scale is Adjustment, with 37 items distributed across 8 HICs; the smallest scale is Learning Approach, with 14 items distributed across 4 HICs. The 7 primary scales contain a total of 41 HICs.

Table 3.1

The Constituent HICs for the Seven HPI Scales

Scale Name	**Description**	
Adjustment	Measures the degree to which a person appears calm and self-accepting.	
HICs	**Description**	**Sample Item**
Empathy	Concern for others	I dislike criticizing people, even when they need it.
Not Anxious	Absence of worry	Deadlines don't bother me.
No Guilt	Absence of regret	I rarely feel guilty about the things I have done.
Calmness	Not volatile	I keep calm in a crisis.
Even Tempered	Patience	I hate to be interrupted.
No Complaints	Complacence	I almost never receive bad service.
Trusting	Belief in others	People really care about one another.
Good Attachment	Good relations with authority	In school, teachers liked me.
Ambition	Measures the degree to which a person is leader-like, competitive, energetic, and socially self-confident.	
HICs	**Description**	**Sample Item**
Competitive	Desire to win	I want to be a success in life.
Self Confident	Self-assurance	I expect to succeed at everything.
Accomplishment	Personal effectiveness	I am known as someone who gets things done.
Leadership	Leadership tendencies	In a group I like to take charge of things.
Identity	Satisfaction with one's life	I know what I want to be.
No Social Anxiety	Social self confidence	I don't mind talking in front of a group of people.
Sociability	Measures the degree to which a person seems to need and/or enjoy interactions with others.	
HICs	**Description**	**Sample Item**
Likes Parties	Affability	I would go to a party every night if I could.
Likes Crowds	Affiliativeness	Being part of a large crowd is exciting.
Experience Seeking	Needs variety	I like a lot of variety in my life.
Exhibitionistic	Showing-off	I like to be the center of attention.
Entertaining	Being witty and engaging	I am often the life of the party.
Interpersonal Sensitivity	Measures the degree to which a person is seen as perceptive, tactful, and socially sensitive.	
HICs	**Description**	**Sample Item**
Easy to Live With	Being easy-going	I work well with other people.
Sensitive	Being considerate	I always try to see the other person's point of view.
HICs	Description	Sample Item
Caring	Social sensitivity	I am sensitive to other people's moods.
Likes People	Companionable	I enjoy just being with other people.
No Hostility	Tolerant	I would rather not criticize people, even when they need it.
Prudence	Measures the degree to which a person is conscientious, conforming, and dependable.	
HICs	**Description**	**Sample Item**
Moralistic	Self-righteousness	I always practice what I preach.
Mastery	Diligent	I do my job as well as I possibly can.
Virtuous	Perfectionism	I strive for perfection in everything I do.
Not Autonomous	Conformity	Other people's opinions of me are important.
Not Spontaneous	Planful	I always know what I will do tomorrow.
Impulse Control	Self-discipline	I rarely do things on impulse.
Avoids Trouble	Professed probity	When I was in school, I rarely gave the teachers any trouble.
Inquisitive	Measures the degree to which a person is perceived as bright, creative, and interested in intellectual matters.	
HICs	**Description**	**Sample Item**
Science	Analytical	I am interested in science.
Curiosity	Investigative	I have taken things apart just to see how they work.
Thrill Seeking	Stimulus seeking	I would like to be a race car driver.
Intellectual Games	Playful cognition	I enjoy solving riddles.
Generates Ideas	Ideational fluency	I am known for having good ideas.
Culture	Cultural interests	I like classical music.
Learning Approach	Measures the degree to which a person enjoys academic activities and values educational achievement for its own sake.	
HICs	**Description**	**Sample Item**
Good Memory	Powers of recall	I have a large vocabulary.
Education	Academic talent	As a child, school was easy for me.
Math Ability	Numerical talent	I can multiply large numbers quickly.
Reading	Verbal talent	I would rather read than watch TV.

3.6 Composition of the Personality Scales: The 2007 Confirmatory Factor Analysis

Although the 1992 exploratory factor analysis *(R. Hogan & Hogan, 2007)* indicates a substantive factor structure, modern psychometrics now have developed procedures to allow data to be fitted to a predetermined factor model, and to be tested for acceptable statistical fit to the data. The general model-fitting process is known as structural equation modeling. In the particular case of fitting factor models to data, it is known as confirmatory factor analysis (CFA). Essentially, the procedure requires that we fit the ideal simple structure HPI model to data, where HIC scores are accounted for by a single HPI factor and no HIC loads on any factor other than its designated HPI factor. In CFA, we set to zero all non-keyed HIC loadings, and estimate values only for keyed HIC-factor loadings. Also, we can fit models where the factors are expected to be correlated, or where we force the factors to be independent from one another.

Therefore, the key difference between the 1992 analysis and the one reported next is that the former is an exploratory analysis, where a set of dimension reducing and coordinate rotation procedures are used to discover the HPI factor structure (albeit some expectations obviously were present from the design of the questionnaire itself). In the analysis reported here, we present the current expected idealized factor model as a "target," then fit this to the data using the structural equation modeling procedure. This fit process confirms (or not) the expected factor structure, which is why it is called Confirmatory Factor Analysis. Using the theory-based conceptualization of the HPI along with the evidence of the 1992 seven-factor structure, we calculated a CFA using the 2005 normative sample dataset, including all 156,614 respondent records.

Figure 3.1 presents a graphic schematic of the final HPI model fitted to the data. The lines between boxes and ovals represent two kinds of parameters (also known as paths) to be estimated. The arrows from the latent HPI factors (ovals) to the HIC variables (rectangles) represent the factor loadings to be estimated; it is hypothesized that the latent unobserved factors "cause" the observed HIC cluster scores. The curved lines between each latent factor represent factor correlations to be estimated. However, although previous investigations indicated that a better fit to the HPI model was found by modeling oblique factors, we also computed an orthogonal HPI model and compared the relative fit of the two models via a statistical chi-square test.

Prior to the modeling analyses, we tested one of the main assumptions of structural equation modeling and CFA, which uses maximum likelihood parameter estimation. The assumption is that data are multivariate normally distributed. To investigate the validity of this assumption, we used Mardia's *(1970, 1974)* test for multivariate kurtosis using the EQS 6.1 Structural Equation modeling software *(Bentler & Wu, 2006)*. The test result indicated that the data were not distributed as multivariate normal, with a normalized estimate of 1377.0481. Values larger than about 5 or 6 indicate substantive positive kurtosis and non-normality. Thus, all modeling proceeded using the Robust option in EQS, which computes robust residual test statistics, standard error parameters, and the Satorra-Bentler *(1994)* adjusted chi-square and related model fit indices.

The initial comparison of an orthogonal factor HPI model to an oblique model was computed using the Satorra-Bentler *(2002)* scaled difference chi-square test (as the conventional chi-square model difference test is invalid when using adjusted chi-squares). The oblique model fit statistically and significantly better than the orthogonal model SBdiff _2 = 146788.2005, df = 21, p< 0.0001. This is to be expected because most personality psychological variables are all statistically correlated with each other to some small degree, even, when for all practical purposes, they can be treated as independent.

As seen in Figure 3.1, we fit the oblique factor model to the normative sample of 156,614 respondents, using EQS 6.1. to implement maximum likelihood estimation on covariances between HICs, with robust adjustment of the chi-square statistic. The Satorra-Bentler chi-square was 418824.1731 with 758 df, and p < 0.0001. As expected with such a huge sample, the chi-square exact test of fit indicated statistically significant departures (residual error) from the observed and model implied covariance matrices. Under these conditions, we examined the standardized residual matrix to ascertain the extent to which residuals are substantively discrepant. We used a custom residual matrix analysis computer program RDEVAL. The mean absolute residual discrepancy was 0.0534, with the mean standardized residual -0.0013, and the root-mean-square-residual of 0.0739. Ninety percent of all standardized residuals were found between -0.1207 and 0.1164, with 95% found between -0.163 and 0.1498, and the largest positive and negative standardized residuals being 0.4103 and -0.3247, respectively. Figure 3.2 shows the histogram of standardized residuals for this solution. Taking these results together with the robust RMSEA of 0.59 (with 90% confidence intervals also at 0.59 due to the huge sample size), we concluded that, for all practical purposes, the model provided a reasonable fit to the data, although not perfect.

Table 3.2 shows the correlations estimated between the seven latent factors, alongside the observed scale score correlations. As seen, the latent factor correlations are always larger than their observed score counterparts. This is because the CFA modeling estimates latent factor correlations which are free from measurement error (which is accounted for in the modeling process), unlike observed data correlations which do contain measurement error (and are normally corrected using a standard disattenuation formula if the theoretical maximum correlations are required).

Table 3.2
Intercorrelations Between HPI Observed Scale Scores and Latent Factor Scores

Scales	1	2	3	4	5	6
1) Adjustment						
2) Ambition	.42 (.64)					
3) Sociability	.04 (.07)	.41 (.58)				
4) Interpersonal Sensitivity	.40 (.62)	.23 (.55)	.19 (.45)			
5) Prudence	.54 (.81)	.16 (.32)	-.19 (-.21)	.34 (.54)		
6) Inquisitive	.19 (.28)	.36 (.54)	.47 (.69)	.16 (.32)	.04 (.15)	
7) Learning Approach	.34 (.48)	.35 (.58)	.20 (.35)	.21 (.39)	.28 (.44)	.40 (.60)
Note. Figures in ( ) are the latent variable correlations from the CFA.						

Figure 3.1

HIC-Level Confirmatory Factor Model for the HPI

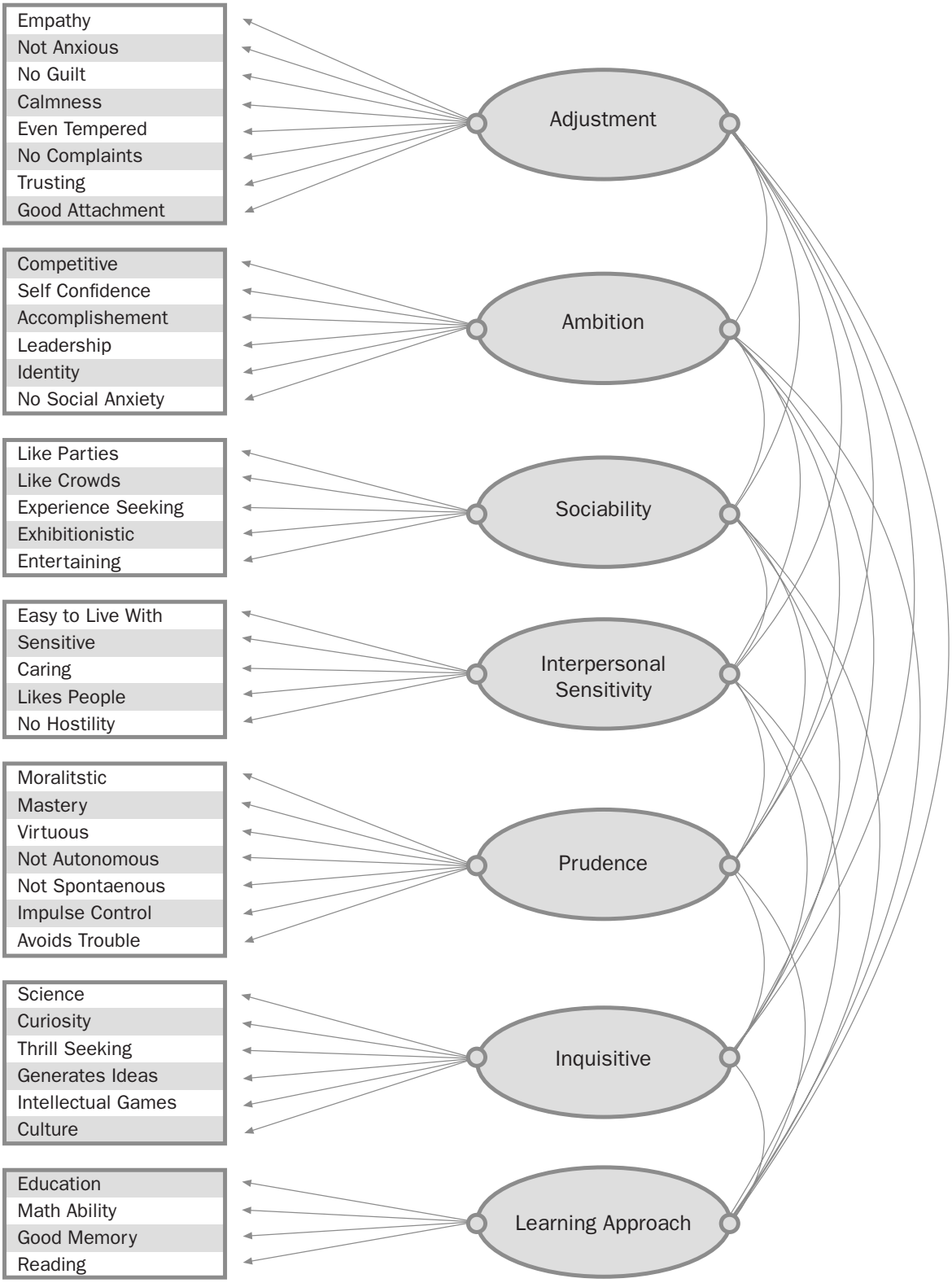


Figure 3.2

Histogram of Standardized Residuals for the Oblique Factor Model with Maximum Likelihood Parameter Estimation

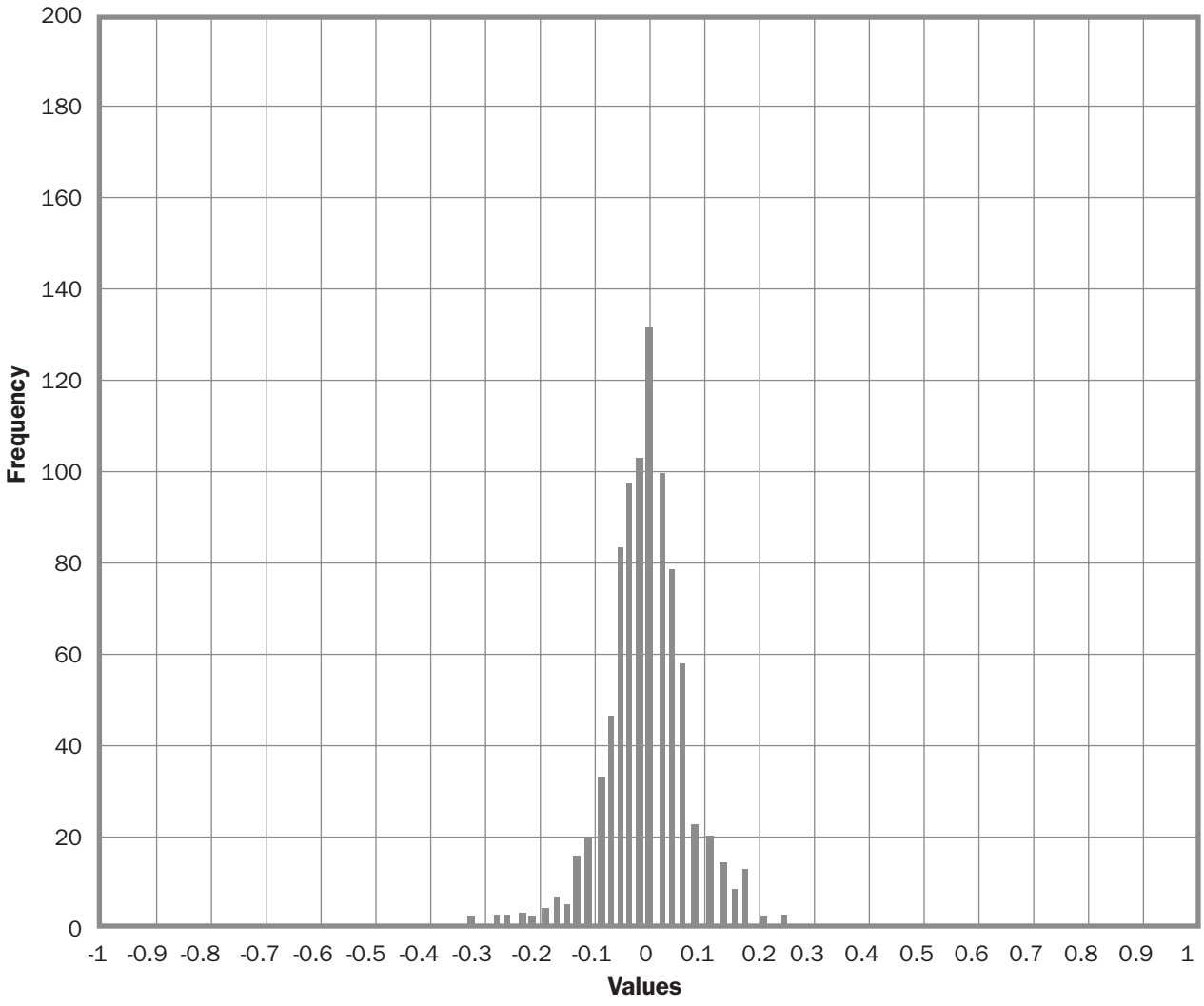


Table 3.3 shows the factor loadings for the HPI HICs estimated from the CFA analysis. Note that there are no cross-loadings. In CFA, non-keyed item loadings are constrained to zero by default, thus, this is the best possible simple structure for the HPI for this dataset. In comparison to the 1992 factor loadings, the Principal Component Analysis (PCA) and Varimax solution, the loadings in Table 3.3 are slightly lower. This is because PCA differs from maximum likelihood common factor analysis in that it analyzes all the variance available in a matrix including measurement error and variance specific only to an individual HIC variable. However, common factor analysis methods partial out measurement and unique variable variance, and only extract factors that account for the remaining common variance. Hence, these loadings always tend to be smaller than PCA component loadings[1].

[1]Although it is tempting to treat these loadings as "precise" real-valued numbers, for practical purposes, it matters little to the scale scores whether we use the exact weights (the factor loadings) to construct weighted scale scores or simply sum the HIC scores to produce a scale score. Grice and Harris *(1998)* and Grice *(2001a,b)* show this statement is false unless the factor pattern is a perfect, simple structure with zero complexity (cross-loadings), but this is exactly what the CFA model represents. Further, given the unknown quantitative structure of the item responses and HIC cluster scores we are dealing with *(Michell, 1997, Barrett, 2003)*, it is justifiable to treat the numbers as pragmatically useful magnitudes, rather than precise multi-decimal place estimates of magnitudes as with estimates of length or weight.

Table 3.3

CFA factor Loadings for the HPI HICs

Scales	Factor						
HICs	I	II	III	IV	V	VI	VII
Adjustment							
Empathy	.61						
Not Anxious	.53						
No Guilt	.63						
Calmness	.41						
Even Tempered	.63						
No Complaints	.44						
Trusting	.39						
Good Attachment	.49						
Ambition							
Competitive		.45					
Self Confidence		.47					
Accomplishment		.38					
Leadership		.49					
Identity		.35					
No Social Anxiety		.69					
Sociability							
Likes Parties			.56				
Likes Crowds			.53				
Experience Seeking			.60				
Exhibitionistic			.54				
Entertaining			.64				
Interpersonal Sensitivity							
Easy to Live With				.40			
Sensitive				.30			
Caring				.37			
Likes People				.63			
No Hostility				.31			
Prudence							
Moralistic					.59		
Mastery					.39		
Virtuous					.61		
Not Autonomous					.08		
Not Spontaneous					.31		
Impulse Control					.51		
Avoids Trouble					.41		
Inquisitive							
Science Ability						.62	
Curiosity						.44	
Thrill Seeking						.47	
Intellectual Games						.49	
Generates Ideas						.63	
Culture						.46	
Learning Approach							
Education							.61
Math Ability							.47
Good Memory							.71
Reading							.51

However, the data in Table 3.3 represent the current best picture of the structure of the HPI. All except one of the 41 HIC factor loadings, “Not Autonomous” on the Prudence factor V, meet or exceed the conventional 0.30 lower bound for substantive factor loadings. In addition, all HICs are constrained to be exactly zero on all non-keyed factors. This is a zero-complexity factor solution.

3.7 HPI Scale Distributions and Reliability

Having identified and generated the empirical evidence supporting the structure of the seven HPI scales, the next step is to produce descriptive, item metric, and scale-score based statistics required for practitioners and researchers who might wish to use the test in applied practice. Probably the two most important indices associated with a test score (whether main scale or HIC) are the estimates of reliability and the standard error associated with a test score. The two most popular estimates of score reliability are one estimating the internal consistency of a set of items, and one estimating the reproducibility/stability of a score for an individual over two or more test occasions.

Internal consistency reliability is an estimate of how well all the constituent components of a sum scale score (whether items or HICs) estimate the same common construct or attribute. If all the components of a scale score measure the same construct, then internal consistency reliability will be high (near 1.0). However, if the components of a sum score are measuring different things, then internal consistency will be near zero. The most substantive practical consequence of low internal consistency is that individuals can attain the same scale score on a particular scale by acquiring scores on constituent components of the scale, which measure completely different attributes. This affects predictive accuracy of those scores because the link between a scale score and some outcome is diluted by the fact that the scores are merely estimates of different attributes, although they might be equivalent between individuals. Therefore, the aim in scale design is to ensure that the components of a coherent scale score all measure the same attribute to some non-trivial degree.

If we were to ask a slightly-reworded item 10 times, and use the summed responses to these items as a scale score, we would find the internal consistency coefficient for the scale might be as high as 0.98 and thus tempt us to report our scale as highly reliable. The obvious response to this is that the scale is also very narrow in meaning, that is confined to the content of a single item. Our desire is to widen the breadth of meaning using the constituent items, while preserving the desired common meaning of the attribute to be assessed. The trade-off is that too much breadth can lead to items that are measuring different attributes, too little breadth and we are back to single-item rewords of a common item. This is a test design issue where the hypothesized breadth of attribute meaning guides the development of the constituent items; sections 3.1 through 3.4 of this chapter detail such a design process for the HPI. Sections 3.5 and 3.6 provide support for the desired dimensionality of the seven scale inventory structure. In this section, we report results for the reliability of these scales and their components.

Estimating internal consistency reliability for the seven HPI scale scores is not straightforward because there are two kinds of constituent components of the seven HPI scale scores; these components are inventory items and HICs. First, if we compute the internal consistency of a scale using item responses as components of the sum score, we have to assume that all the items in our scale are drawn from a single hypothetical universe of items measuring the attribute in question. Using statistical sampling theory,

applied to the items as a sample from a universe of such items, it is possible to estimate the average correlation between our inventory scale and the hypothetical universe of all possible scales constructed from all possible items measuring the single attribute. That estimated average correlation is the internal consistency reliability of the scale and is known as coefficient alpha *(Cronbach, 1951)*. However, when we use HICs to form a scale score, the HICs become the constituent components of our attribute, but each "composite" component is now assumed to be constructed from items drawn from its own discrete universe of items. Therefore, the estimation of the "composite reliability" of a linear combination of HIC scores for an HPI scale needs to take into account both the reliability of each component HIC score as well the size of relationships between these HICs. These considerations are discussed more comprehensively by Nunnally and Bernstein *(1994)*.

The respective formulae for Cronbach's alpha and composite reliability appear below:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} s_i^2}{s_T^2}\right)$$

where

$k =$ the number of items in the scale

$s_i^2 =$ the sample varience of item *i* of *k* items

$s_T^2 =$ the sample variance of the scale scores

which can also be expressed as:

$$\alpha = \frac{k}{k-1}\left(\frac{\bar{R} - k}{\bar{R}}\right)$$

where

$\bar{R} =$ the sum of all the pairwise correlations between all *k* items in the scale including the diagonal values of the correlation matrix, k^2 correlations in total

Composite reliability for an HPI scale is calculated as:

$$r_c = 1 - \frac{k - \sum_{i=1}^{k} \alpha_i}{\bar{R}}$$

where

$k =$ the number of component scales

$r_c =$ the composite reliability of the test scale

$\alpha_i =$ the alpha reliability of HIC cluster *i* of *k* clusters

$\bar{R} =$ the sum of all the pairwise correlations between all *k* items in the scale including the diagonal values of the correlation matrix, k^2 correlations in total

From the logic of domain sampling theory (true score theory on which coefficient alpha is based), it appears that the most appropriate reliability coefficient to be used in the future for each of the seven HPI scale scores is in fact the composite reliability estimate, as each HIC cluster score is considered a sample of items from a discrete attribute universe. When dealing with hypotheticals such as "item universes" and "infinite domains," what matters is the pragmatic consequence of such a decision. This consequence is reflected in parameters or procedures which rely upon the use of a reliability estimate. The most important one for practitioners is the standard error of measurement associated with a test score. Therefore, in tables 2.5 and 2.6 below, both reliability estimates for the seven HPI scales are included for comparative purposes, along with the standard error of measurement computed using each reliability estimate.

Another misconception prevalent in many test manuals is the use of an inappropriate estimate of the standard error of measurement for an observed test score. We use the equation provided by Dudek *(1979)*, 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 and Bernstein *(1994, 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

$r_{xx} =$ the reliability of the test

This formula is applicable for estimating a range 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.

For example, if we observe a score on Adjustment of 26, given the scale mean, standard deviation and Cronbach alpha in Table 3.4, then if we wished to use sem_1 as our estimate of the standard error of measurement, we would first need to compute the estimate of the true score (for an observed score of 26), using the formula given below:

$$t' = \left(r_{xx}\left(x - \overline{x}\right)\right) + \overline{x}$$

where

$t' =$ the estimated true score

$r_{xx} =$ the reliability of the test scale

$x =$ the observed scale score

$\overline{x} =$ the global normative scale score

So, for our observed score of 26 on Adjustment, we would calculate *t'* as:

$t' =$ (0.82(26-31.18)) + 31.18

$t' =$ 26.93

Then we apply sem_1 (2.00) as our estimate of the standard error of measurement to this value of 26.93 to estimate a confidence interval of observed scores for this fixed true score. Given this sem_1, an interval within which we might expect to find 68% of all observed scores for the individual who scored 26 would extend from 25 through to 29. If we had applied this sem_1 to the observed score of 26, we would have computed the interval as between 24 and 28.

Alternatively, if we applied sem_3 (2.70) to the observed score (which is the more correct method to estimate the likely range of observed scores from an initial, fixed, observed score), we would obtain the same 68% confidence interval as between 23 and 29. Therefore, the choice of an appropriate formula can have a substantive impact on the confidence interval estimation for an individual's score.

For the sake of completeness, we provide both sem_3 and sem_1 estimates in Tables 3.4 and 3.5, based on item alphas and composite reliability estimates.

Table 3.4

Classical Item and Scale Statistics for the HPI

Scale	Number of Items	Mean	SD	Cronbach Alpha (a)	Mean inter-item correlation	sem_1 *a*	sem_3 *a*
HICs							
Adjustment	**37**	**31.18**	**4.72**	**.82**	**.12**	**2.00**	**2.70**
Empathy	5	4.36	1.01	.57	.21	.66	.83
Not Anxious	4	2.97	1.15	.59	.27	.74	.93
No Guilt	6	4.92	1.30	.64	.24	.78	1.00
Calmness	4	3.42	0.70	.25	.11	.61	.68
Even Tempered	5	4.51	0.82	.48	.17	.59	.72
No Complaints	5	4.67	0.69	.44	.14	.52	.62
Trusting	3	2.28	0.83	.41	.21	.64	.76
Good Attachment	5	4.05	1.26	.68	.32	.71	.92
Ambition	**29**	**25.95**	**3.36**	**.80**	**.12**	**1.50**	**2.02**
Competitive	5	4.72	0.58	.31	.11	.48	.55
Self Confidence	3	2.86	0.41	.34	.14	.33	.39
Accomplishment	6	5.84	0.58	.66	.29	.34	.44
Leadership	6	4.75	1.62	.76	.36	.79	1.05
Identity	3	2.69	0.72	.71	.45	.39	.51
No Social Anxiety	6	5.08	1.38	.72	.31	.73	.96
Sociability	**24**	**14.24**	**4.68**	**.83**	**.17**	**1.93**	**2.61**
Likes Parties	5	2.47	1.26	.62	.24	.78	.99
Likes Crowds	4	2.74	1.40	.76	.45	.69	.91
Experience Seeking	6	4.67	1.37	.57	.19	.90	1.13
Exhibitionistic	5	2.06	1.55	.71	.33	.83	1.09
Entertaining	4	2.30	1.29	.64	.33	.77	.99
Interpersonal Sensitivity	**22**	**20.43**	**1.70**	**.57**	**.08**	**1.11**	**1.40**
Easy to Live With	5	4.87	0.41	.30	.11	.34	.39
Sensitive	4	3.63	0.63	.23	.07	.55	.61
Caring	4	3.85	0.41	.22	.11	.36	.40
Likes People	6	5.64	0.78	.56	.23	.52	.65
No Hostility	3	2.44	0.68	.26	.13	.58	.66
Prudence	**31**	**23.27**	**3.91**	**.71**	**.08**	**2.11**	**2.75**
Moralistic	5	3.25	1.25	.53	.19	.86	1.06
Mastery	4	3.62	0.66	.34	.13	.54	.62
Virtuous	5	4.07	0.94	.37	.11	.75	.87
Not Autonomous	3	2.03	1.08	.67	.40	.62	.80
Not Spontaneous	4	2.82	0.95	.32	.12	.78	.90
Impulse Control	5	3.40	1.30	.56	.21	.86	1.08
Avoids Trouble	5	4.08	0.99	.38	.13	.78	.92
Inquisitive	**25**	**16.55**	**4.52**	**.80**	**.13**	**2.02**	**2.71**
Science Ability	5	3.45	1.36	.56	.21	.90	1.13
Curiosity	3	2.57	0.71	.50	.26	.50	.61
Thrill Seeking	5	2.35	1.65	.72	.34	.87	1.15
Intellectual Games	3	2.27	0.88	.48	.24	.63	.77
Generates Ideas	5	3.59	1.21	.56	.21	.80	1.00
Culture	4	2.31	1.31	.58	.26	.85	1.07
Learning Approach	**14**	**10.21**	**3.00**	**.78**	**.21**	**1.41**	**1.88**
Education	3	2.48	0.82	.60	.35	.52	.66
Math Ability	3	2.08	1.11	.74	.51	.57	.75
Good Memory	4	3.35	0.95	.56	.26	.63	.79
Reading	4	2.29	1.40	.69	.36	.78	1.01

Note. sem_1 a = the standard error of measurement to be applied to the estimated true score for an individual given their observed score. sem_3 a = the standard error of measurement to be applied to the observed score for an individual.

Table 3.5

Composite Alphas and Standard Errors of Measurement for the Seven HPI Scales

Scale	a	r_c	sem_1 a	sem_1 r_c	sem_3 a	sem_3 r_c
Adjustment	.82	.83	2.00	1.95	2.70	2.63
Ambition	.80	.80	1.50	1.50	2.02	2.02
Sociability	.83	.85	1.93	1.81	2.61	2.47
Interpersonal Sensitivity	.57	.59	1.11	1.09	1.40	1.37
Prudence	.71	.73	2.11	2.03	2.75	2.67
Inquisitive	.80	.82	2.02	1.92	2.71	2.59
Learning Approach	.78	.82	1.41	1.27	1.88	1.72

Note. r_c = estimate of composite reliability; a = coefficient alpha

For comparative purposes, although the sets of indices presented in Tables 3.4 and 3.5 are exhaustive, for operational purposes we would recommend the use/interpretation of composite alpha reliabilities (rc) for the HPI scales, and the use of sem_3 estimates for the standard errors of measurement for both HICs and main scales. This latter recommendation is specifically relevant for the situation where the aim is to use the standard deviation of observed scores given an individual's observed score is held constant. This has particular relevance for computing a confidence interval around an observed score.

Chapter 6 and Appendix A provide detailed tables of score frequency distributions, normative percentile tables, and descriptive statistics for the total normative sample and the sample subdivided by age, gender, and ethnicity.

3.8 HPI Test-Retest Reliability

Two studies form the basis of evidence for short and long-term test-retest stability for the HPI HIC clusters and the seven HPI scales. In reporting the results, two kinds of stability coefficients are utilized, a Pearson correlation and the Shrout and Fleiss *(1979)* Model 2 intraclass correlation coefficient. Both coefficients are measures of agreement, but the most popular coefficient used to index test-retest reliability, Pearson correlation, is sensitive only to monotonic differences in variable magnitudes, while the Model 2 intraclass is highly sensitive to differences in both monotonicity and magnitude.

Examining test-retest stability is akin to person-target profiling, where the magnitude discrepancy between scores is of paramount importance. As Barrett *(2005)* shows, the choice of agreement coefficient is critical to the correct expression of agreement where both monotonic and magnitude differences are of importance to the investigator. For example, look at the set of test-retest data below in Table 3.6 and their graphical depiction in Figure 3.3. These show scores that are highly related in terms of monotonicity but discrepant in terms of magnitudes; that is, in the language of test-retest reliability *(Stemler, 2004)* the data for occasion 2 show consistency (monotonicity) but little consensus (magnitude equivalence).

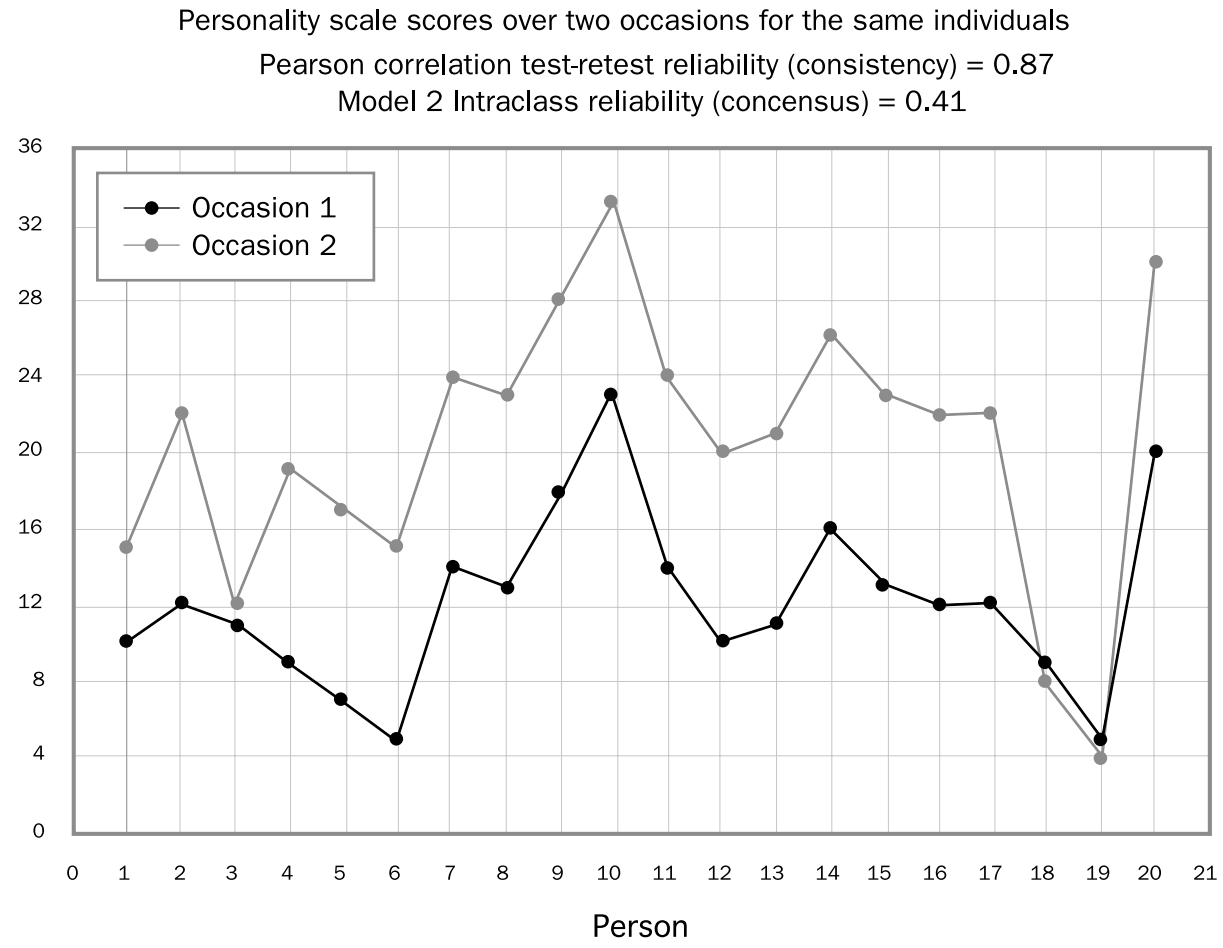
Table 3.6

Hypothetical Scores on a Personality Scale over Two Test Occasions

Person	Occasion 1	Occasion 2
1	10	15
2	12	22
3	11	12
4	9	19
5	7	17
6	5	15
7	14	24
8	13	23
9	18	28
10	23	33
11	14	24
12	10	20
13	11	21
14	16	26
15	13	23
16	12	22
17	12	22
18	9	8
19	5	4
20	20	30

Figure 3.3

Hypothetical Scores and Test-Retest Reliabilities for a Personality Scale over Two Test Occasions



What this example demonstrates is that the Model 2 intraclass coefficient is sensitive to magnitude discrepancies between the occasion scores. The Pearson correlation of 0.87 would seem to indicate excellent test-retest stability, yet what we see "by eye" is not reflected at all in this index. In contrast, the Model 2 intraclass coefficient of 0.41 does seem to better reflect the real discrepancies between scores. Sometimes, it is sufficient to simply know scores are related, which is why the Pearson correlation is a convenient and useful index of any such relationship. However, where the magnitude differences in scores are critical (as in test-retest or person-target profiling/cut-score analyses), then the Pearson correlation coefficient can sometimes mislead the investigator into concluding that the scores are nearly equivalent (as in the example above), even when they are clearly discrepant. Thus, when we report upon test-retest stability below, we provide the conventional Pearson correlation for "familiarity reasons" along with the preferred Model 2 intraclass coefficient and the mean absolute difference between occasion scores. This provides a more comprehensive and informative approach to estimating test-retest stability.

Short-Term Stability. A sample of 87 undergraduates enrolled in junior or senior level business courses at a public midwestern university were administered the HPI twice. Administration format (computer or paper-and-pencil) was randomized across students, with each student being administered the test twice using the same administration format. The sample consisted of 40 males and 47 females, with mean ages of 24.92 and 26.48 years, and standard deviations of 5.09 and 7.69 years, respectively. Sample ethnicity was 72% White, 14% Black, 13% Asian, and 1% Hispanic. Test administration was proctored for both types of administration conditions, with test-sessions lasting up to one hour. The duration of test-retest interval varied across students, within the range 14 to 21 days. The test-retest stability indices for the seven HPI scales and HICs are provided in Table 3.7.

As indicated in Table 3.7 by the mean absolute differences between occasion 1 and 2 test scores, there are only small magnitude discrepancies between these two sets of scores. This is reflected in the almost identical Pearson and Intraclass reliability coefficients. The majority of reliability indices are above 0.70, with many exceeding 0.80. Overall, the mean intraclass reliability across all 48 indices is 0.72.

Long-Term Stability. These data were drawn from a study examining the stability of HPI test scores from 141 adult job applicants over an 8 year test-retest interval. The sample was opportunistic in that these individuals happened to be applying for jobs with a nationwide US employer for whom they had previously applied 8 years earlier. The sample consisted of 93 males and 48 females, with mean ages of 35.55 and 28.96 years, and standard deviations of 10.1 and 8.52 years, respectively. Sample ethnicity was 28% White, 36% Black, 11% Asian, and 6% Hispanic, with 19% of applicants not reporting their ethnicity. Test administration was proctored for both administration conditions. The test-retest stability indices for the seven HPI scales and HICs are provided in Table 3.8.

As can be seen in this table by the mean absolute differences between occasion 1 and 2 test scores, there are only relatively small magnitude discrepancies between these two sets of scores except for the HPI scale of Ambition. Here there is a mean absolute difference of 4.39, which is associated with a much reduced intraclass reliability estimate of 0.27 instead of the Pearson correlation of 0.49. Overall, the mean intraclass reliability across all 48 indices is 0.43, much lower than the 14-21 day interval estimate. But, this is what would be expected given such a long duration between test occasions; notably the mean absolute discrepancies between scores remain low.

This chapter has described how the scales of the HPI and its subsequent revisions were developed. The next chapter concerns the validity of these scales.

Table 3.7
Short-Term (14-21 day interval) Test-Retest Stability Indices for the HPI

Scale	Pearson Correlation	Model 2 Intraclass Correlation	Mean Absolute Score Difference
Adjustment	**0.87**	**0.87**	**2.69**
Empathy	0.75	0.75	0.74
Not Anxious	0.68	0.68	0.74
No Guilt	0.76	0.76	0.89
Calmness	0.68	0.68	0.57
Even Tempered	0.69	0.69	0.69
No Complaints	0.71	0.70	0.59
Trusting	0.63	0.63	0.57
Good Attachment	0.79	0.80	0.67
Ambition	**0.83**	**0.83**	**2.00**
Competitive	0.69	0.69	0.44
Self Confidence	0.62	0.62	0.36
Accomplishment	0.81	0.77	0.52
Leadership	0.81	0.81	0.71
Identity	0.78	0.78	0.48
No Social Anxiety	0.77	0.77	0.87
Sociability	**0.86**	**0.85**	**1.78**
Likes Parties	0.79	0.79	0.54
Likes Crowds	0.79	0.77	0.59
Experience Seeking	0.62	0.62	0.84
Exhibitionistic	0.71	0.71	0.75
Entertaining	0.82	0.82	0.52
Interpersonal Sensitivity	**0.70**	**0.70**	**1.41**
Easy to Live With	0.40	0.39	0.43
Sensitive	0.59	0.59	0.38
Caring	0.56	0.56	0.21
Likes People	0.75	0.75	0.52
No Hostility	0.59	0.58	0.60
Prudence	**0.69**	**0.69**	**2.64**
Moralistic	0.50	0.50	0.95
Mastery	0.60	0.60	0.54
Virtuous	0.71	0.71	0.57
Not Autonomous	0.64	0.63	0.57
Not Spontaneous	0.59	0.59	0.63
Impulse Control	0.66	0.66	0.86
Avoids Trouble	0.68	0.68	0.60
Inquisitive	**0.84**	**0.84**	**1.99**
Science Ability	0.79	0.79	0.61
Curiosity	0.73	0.72	0.39
Thrill Seeking	0.83	0.83	0.62
Intellectual Games	0.62	0.62	0.51
Generates Ideas	0.71	0.71	0.72
Culture	0.84	0.84	0.47
Learning Approach	**0.85**	**0.85**	**1.14**
Education	0.80	0.80	0.33
Math Ability	0.85	0.86	0.31
Good Memory	0.78	0.77	0.47
Reading	0.82	0.81	0.39

Table 3.8
Long-Term (8 years interval) Test-Retest Stability Indices for the HPI

Scale	Pearson Correlation	Model 2 Intraclass Correlation	Mean Absolute Score Difference
Adjustment	**0.43**	**0.44**	**2.57**
Empathy	0.24	0.24	0.77
Not Anxious	0.04	0.02	1.50
No Guilt	0.46	0.46	1.16
Calmness	0.11	0.11	0.69
Even Tempered	0.34	0.29	1.05
No Complaints	0.01	0.00	2.24
Trusting	0.50	0.50	0.66
Good Attachment	0.46	0.46	0.91
Ambition	**0.49**	**0.27**	**4.39**
Competitive	0.39	0.39	0.42
Self Confidence	0.27	0.26	0.30
Accomplishment	0.02	0.01	1.73
Leadership	0.50	0.50	1.18
Identity	0.27	0.27	0.48
No Social Anxiety	0.59	0.59	1.01
Sociability	**0.63**	**0.63**	**2.92**
Likes Parties	0.51	0.51	0.92
Likes Crowds	0.51	0.50	1.04
Experience Seeking	0.57	0.56	0.95
Exhibitionistic	0.52	0.52	0.97
Entertaining	0.55	0.54	0.85
Interpersonal Sensitivity	**0.30**	**0.29**	**1.54**
Easy to Live With	0.39	0.36	0.21
Sensitive	0.29	0.29	0.48
Caring	0.12	0.12	0.29
Likes People	0.40	0.40	0.70
No Hostility	0.49	0.49	0.40
Prudence	**0.46**	**0.44**	**3.23**
Moralistic	0.50	0.50	1.01
Mastery	0.35	0.35	0.42
Virtuous	0.39	0.38	0.74
Not Autonomous	0.53	0.53	0.79
Not Spontaneous	0.38	0.36	0.82
Impulse Control	0.54	0.53	0.79
Avoids Trouble	0.28	0.28	0.79
Inquisitive	**0.73**	**0.72**	**2.52**
Science Ability	0.58	0.58	0.84
Curiosity	0.46	0.46	0.39
Thrill Seeking	0.65	0.65	0.89
Intellectual Games	0.55	0.54	0.52
Generates Ideas	0.61	0.61	0.79
Culture	0.57	0.56	0.82
Learning Approach	**0.65**	**0.65**	**1.97**
Education	0.42	0.42	0.63
Math Ability	0.65	0.65	0.59
Good Memory	0.60	0.60	0.62
Reading	0.66	0.66	0.77

4. GENERALIZING VALIDITY EVIDENCE FROM THE FIVE-FACTOR MODEL AND THE HPI

Prior to 1977, criterion-related validity research involved testing the hypothesis that a particular predictor variable (e.g., a cognitive ability measure) covaried reliably with a particular criterion variable (e.g., performance in training). Researchers then repeated this test using different samples, predictors, and criterion measures. Not surprisingly, results from these studies often differed between locations with similar jobs, and this variability made firm generalizations difficult. More importantly, this variability challenged the scientific integrity of the entire enterprise of personnel selection.

Researchers often explained the differences in study results in terms of situational specificity, the view that the validity of a measure is specific to the contexts and jobs under study *(Gatewood & Feild, 1994; Ghiselli, 1966; Ghiselli & Brown, 1955)*; these differences required conducting separate validation studies for each organization, job, or group of employees. Using a large database, Schmidt and Hunter *(1977)* presented evidence showing that the variability in validity coefficients in single-location studies is due to statistical and procedural factors *(Guion, 1998, p. 368)*—idiosyncratic factors that can be ignored or statistically corrected.

Schmidt and Hunter introduced meta-analysis to psychometric research; meta-analysis is a methodology for aggregating correlation coefficients from independent studies testing the same hypothesis. They argued that differences in a test's validity across studies reflect statistical artifacts (e.g., sampling deficiency) and measurement problems (e.g., predictor/criterion unreliability, range restriction) and not unique jobs or situations. Subsequent research suggests that the correlations between performance measures and cognitive ability tests *(Schmidt & Hunter, 1977)*, biographical data inventories *(Schmidt & Rothstein, 1994)*, personality inventories *(Barrick, Mount, & Gupta, 2003; Hogan & Holland, 2003; Hough, 1992; Judge, Bono, Ilies, & Gerhardt, 2002; Salgado, 1997, 1998; Tett, Jackson, & Rothstein, 1991)*, assessment center exercises *(Arthur, Day, McNelly, & Edens, 2003; Gaugler, Rosenthal, Thornton, & Bentson, 1987)*, and situational judgment tests *(McDaniel, Morgeson, Finnegan, Campion, & Braverman, 2001)* generalize across studies.

Validity generalization (VG) evidence, when available, may be used in place of local validation studies to support the use of a selection procedure *(Gatewood & Feild, 1994; Society for Industrial and Organizational Psychology, 2003)*. As indicated by the *Principles*:

> At times, sufficient accumulated validity evidence is available for a selection procedure to justify its use in a new situation without conducting a local validation research study. In these instances, use of the selection procedure may be based on demonstration of the generalized validity inferences from that selection procedure, coupled with a compelling argument for its applicability to the current situation. Although neither mutually exclusive nor exhaustive, several strategies for generalizing validity evidence have been delineated: (a) transportability, (b) synthetic validity/job component validity, and (c) meta-analytic validity generalization *(p. 27)*.

4.1 Meta-Analysis Results from Accumulated FFM Validity Studies

The *Principles* recognize meta-analysis as a method "that can be used to determine the degree to which predictor-criterion relationships are specific to the situations in which the validity data have been gathered or are generalizable to other situations, as well as to determine the sources of cross-situation variability *(Aguinis & Pierce, 1998)*" *(p. 28)*. Pearson *(1904; as cited in Rosenthal & DiMatteo, 2001)* reported meta-analytic results evaluating the efficacy of vaccinations over 100 years ago. However, the method only was used to evaluate selection test validity in the late 1970s, and it was not the first method to be used *(cf. Lawshe, 1952)*. Of the three VG methods, meta-analysis provides the most generalizable results, but it relies exclusively on criterion-related validity studies. Transportability and synthetic/job component validity research is less generalizable, but can use either content or criterion-related validation research as source data.

Meta-analysis averages findings from multiple studies of the same relationship to provide a best estimate of ρ (i.e., the correlation in the population) by controlling for error due to sampling, measurement range restriction, and moderators *(Smith & Glass, 1977)*. In addition, there are standardized criteria for deciding what studies to include, what variables to code, effect size comparisons, and moderator identification. Ideally, a meta-analysis includes all relevant studies; however, this is often impossible because studies with insignificant results are less likely to be published. Rosenthal *(1979)* notes that this is a problem for meta-analytic research based on few studies, small sample sizes, and an atheoretical base.

According to the *Principles*, "reliance on meta-analysis results is more straightforward when they are organized around a construct or set of constructs" *(p. 30)*. Schmidt and Hunter *(1977)* used a construct orientation in their well-known meta-analysis of cognitive ability measures. Hogan and Holland *(2003)* did the same in a meta-analysis of the validity of personality predictors. A construct driven approach has two advantages. First, theory drives professional judgment, which is unavoidable when compiling data from multiple studies. Second, a theory-driven approach provides a framework for interpreting the results.

Table 4.1 presents the results of six large-scale meta-analyses summarizing relations between the FFM personality scales and job performance, in general. Note that the correlations presented in the table are uncorrected estimates. Across studies, the Conscientiousness/Prudence scale appears to be the most consistent predictor of job performance. The Emotional Stability/Adjustment and Agreeableness/Interpersonal Sensitivity scales also predict performance across studies, although the magnitudes of the correlation coefficients are generally smaller than those for the Conscientiousness/Prudence scale.

Table 4.1

FFM Personality Scale Meta-Analysis Results – Uncorrected Validity Estimates

Reference/Source	EST/ADJ	EXT/AMB	EXT/SOC	AGR/INP	CON/PRU	OPN/INQ	OPN/LRN
A) Tett et al.	.15	.10	.10	.22	.12	.18	.18
B) Barrick & Mount	.05	.01	.01	.06	.21	.01	.01
C) Salgado	.09	.05	.05	.01	.10	.04	.04
D) Hurtz & Donovan	.09	.06	.06	.07	.14	.04	.04
E) Hogan & Holland	.25	.20	N/A	.18	.22	.20	.15
F) Judge et al.	.17	.22	.22	.06	.20	.16	.16

Note. EST/= Emotional Stability/; AMB/= Ambition/; EXT/SOC = Extraversion/Sociability; AGR/= Agreeableness/Sensitivity; CON/= Conscientiousness/; OPN/= Openness/Inquisitive; OPN/= Openness/ Learning Approach. A. Tett, Jackson, & Rothstein (1991). Sample size = 280 (Agreeableness) to 2,302 (Extraversion). B. Barrick & Mount (1991). Sample size = 3,694 (Emotional Stability) to 4,588 (Conscientiousness). C. Salgado (1997). Sample sizes = 2,722 (Openness) to 3,877 (Emotional Stability). D. Hurtz & Donovan (2000). Sample sizes = 5,525 (Openness) to 8,083 (Conscientiousness). E. Hogan & Holland (2003). Sample sizes = 1,190 (Inquisitive) to 3,698 (Ambition). F. Judge, Bono, Ilies, & Gerhardt (2002). Sample sizes = 7,221 (Openness) to 11,705 (Extraversion).

Unlike meta-analyses that evaluate the validity of the FFM scales in relation to overall performance, Hogan and Holland *(2003)* aligned these personality scales with construct-specific performance criteria. Hogan and Holland *(2003)* meta-analyzed 43 independent samples (N = 5,242) using the HPI. The relations between HPI scales and overall performance ratings proved stronger than in previous research, resulting in the following operational validities: Adjustment = .37, Ambition = .31, Interpersonal Sensitivity = .25, Prudence = .31, Inquisitive = .29, Learning Approach = .22 (operational validities are corrected for range restriction and criterion reliability only). As shown in Table 4.2, the fully corrected correlation coefficients ranged from .25 (HPI Learning Approach) to .43 (HPI Adjustment).

Table 4.2
Meta-Analysis Results for HPI Scales with Construct-Aligned Criteria

HPI Scale	*N*	*K*	r_{obs}	*rv*	*r*
Adjustment	2,573	24	.25	.37	.43
Ambition	3,698	28	.20	.31	.35
Sociability	N/A	N/A	N/A	N/A	N/A
Interpersonal Sensitivity	2,500	17	.18	.25	.34
Prudence	3,379	26	.22	.31	.36
Inquisitive	1,190	7	.20	.29	.34
Learning Approach	1,366	9	.15	.22	.25

Note. N = number of participants across K studies; K = number of studies; r_{obs} = mean observed validity; rv = operational validity (corrected for range restriction and criterion reliability only); r = true validity at scale level (corrected for range restriction and predictor-criterion reliability); N/A indicates insufficientdata to compute meta-analysis.

For selection purposes, multiple personality scales should be used to screen job applicants. Multiple scales are needed because one scale is unlikely to map the entire performance domain of any job. Hogan and Holland *(2003)* demonstrate the value of using multiple scales. For example, to predict the ability to tolerate stress, the HPI Adjustment scale is the best single measure. However, to predict resourceful problem solving or the ability to generate creative solutions, the HPI Inquisitive scale yields the largest validity coefficient. Schmidt and Hunter *(1998)* also provide evidence supporting incremental validity of personality measures over general mental ability (GMA). In reviewing over 85 years of selection research, Schmidt and Hunter show that adding a measure of Conscientiousness to GMA tests improved validity by 18%. Furthermore, adding an integrity measure to GMA improved validity by 27%, which is the largest increment of 18 selection measures (e.g., work sample tests, interviews, job knowledge, biographical data, and assessment centers).

The results in Tables 4.1 and 4.2 support the generalizability of Conscientiousness/Emotional Stability/Adjustment, and Agreeableness/Interpersonal Sensitivity measures across occupations and industries. Moreover, the results from Hogan and Holland *(2003)* support the generalizability of every scale on the HPI except Sociability for predicting personality-saturated criteria. Empirical evidence supports validity generalization of three dimensions (i.e., Conscientiousness, Emotional Stability, and Agreeableness) in general, and six of the seven HPI scales in particular.

4.2 Benchmarking Validity Coefficients

The definition of "meaningful" predictor-criterion correlations is vague; consequently, researchers define the meaningfulness of a correlation solely on the basis of its magnitude. Interpreting the usefulness of a correlation coefficient based solely on magnitude is reasonable, because the percentage of variance accounted for in the criterion increases with the magnitude of the correlation. However, at what point does the magnitude of a correlation become meaningful? Is it .10, .20, .30, or .70? There is another strategy for interpreting correlations.

To establish a benchmark for evaluating generalized validity coefficients, Table 4.3 summarizes the sample-weighted validity coefficients of various predictors reported in the scientific literature. The sample-weighted validity of GMA tests, which are widely regarded as the "best" predictors of job performance, is $r = .21$. Relative to the sample-weighted validity coefficients reported by Hogan and Holland *(2003)* for the HPI Adjustment and Prudence scales, GMA appears to be a less valid predictor of construct-oriented criteria (not overall supervisory ratings of job performance). This comparison is also useful for evaluating alternative selection procedures, as required by the *Uniform Guidelines*.

Table 4.3
Comparative Validity of Assessments for Predicting Overall Job Performance

Study	Predictor	Mean *r*
A.	Conscientiousness Tests	.18
B.	Integrity Tests	.21
C.	Structured Interviews	.18
D.	Unstructured Interviews	.11
E.	Situational Judgment Tests	.26
F.	Biodata	.26
G.	General Mental Ability	.21

Note. These scores represent observed score correlations. A. Mount & Barrick (2001). B. Ones, Viswesvaran, & Schmidt (1993). C & D. McDaniel, Whetzel, Schmidt, & Mauer (1994). E. McDaniel, Morgeson, Finnegan, Campion, Braverman (2001). F. Rothstein, Schmidt, Erwin, Owens, & Sparks (1990). G. Pearlman, Schmidt, & Hunter (1980).

Note also the validity FFM scales reported in other meta-analyses (see Table 4.1). Excluding Hogan and Holland's results, the validity of Emotional Stability measures ranges between .05 *(Barrick & Mount, 1991)* and .17 *(Judge, et al., 2002)*. For the Conscientiousness measures, validity coefficients range between .10 *(Salgado, 1997)* and .21 *(Barrick & Mount, 1991)*. For the remaining measures, only Tett et al. *(1991)* and Judge et al. report validity coefficients at or above .10.

Hogan and Holland *(2003)* present validity coefficients (please refer to Table 4.2) that are on average 24% larger than the coefficients reported in previous meta-analyses. There are three important differences between the Hogan and Holland study and other studies. First, Hogan and Holland aligned predictors with indices of job performance. They reasoned that personality scales are not omnibus predictors of job performance; they are intended to predict facets of job performance. By matching predictors and performance criteria, the observed validities increased. Second, most early studies used classification schemes to translate scales from non-FFM instruments (e.g., California Psychological Inventory) into the FFM domains, and raters misclassified scales. These errors decreased validity. Finally, Hogan and Holland relied on a single personality inventory (HPI), which eliminated coding or classification errors. Together these improvements in design establish the appropriate benchmark from which to evaluate the validity of personality scales in occupational settings.

Finally, R. Hogan *(2005, p. 337)* reviewed the validity of some common medical measures and procedures as a way to compare the magnitude of correlations obtained in another field. These ranged from .08 for coronary bypass surgenry and 5 year survival to .44 for height and weight of US adults. The median correlation for the seven coefficients presented was .14 for the effects of ibuprofen on pain reduction. Returning to the field of psychology, Judge, Colbert, and Ilies *(2004)* reported a meta-analysis and fully corrected correlation of .27 between intelligence and leadership ratings. To provide an initial answer to the question about when the magnitude of a correlation becomes meaningful, it appears that a validity coefficient of .30 is unusual at any time for any measure.

4.3 Meta-Analysis Summary for FFM and HPI Validity Studies

In general, previous meta-analysis results indicate that a number of measures predict performance across jobs. Specifically, the HPI scales of Adjustment, Ambition, and Prudence predict performance across jobs and job families. Meta-analytic work also indicates that other personality constructs predict performance in specific job families. Such evidence is presented in later sections of this report, which summarizes validity evidence for each of seven job families.

4.4 Transportability of Validity Evidence

Both the *Uniform Guidelines* and the *Principles* recommend transporting validity evidence to a new situation based on validation research conducted elsewhere. A key consideration for generalizing validity is showing that jobs are comparable in terms of content or requirements. The rationale for transporting test validity across jobs can be summarized in three points:

- Hogan has conducted over 200 criterion-related validity studies assessing the relationship between scores on the HPI and job performance. Results of these studies are available in the Hogan Archive.
- Criterion-related validation results are available for the following seven job families: Managers & Executives, Professionals, Technicians & Specialists, Sales & Customer Support, Administrative & Clerical, Operations & Trades, and Service & Support.
- Results from these studies can be used to determine the validity of the HPI for predicting job performance for each of seven job families.

Because the Hogan Archive contains multiple studies of performance in seven job families and they are generalizable in terms of job requirements, validity evidence for these jobs can be meta-analyzed. We used the meta-analytic procedures specified by Hunter and Schmidt *(1990)* to cumulate results across studies and to assess effect sizes. All studies used zero-order product-moment correlations. Corrections were made for sampling error, unreliability in the measures, and range restriction. Reliability of the personality measures was estimated using within-study coefficient alpha [M = .78; range = .71 (Prudence) to .84 (Adjustment)], rather than relying exclusively on the values reported in the 1995 HPI manual. We followed procedures outlined by Barrick and Mount *(1991)* and Tett et al. *(1991),* and used the .508 reliability coefficient proposed by Rothstein *(1990)* as the estimate of the reliability of supervisory ratings of job performance. We also computed a range restriction index for HPI scales. Following procedures described by Hunter and Schmidt *(1990)*, we divided each HPI scale's within-study standard deviation by the standard deviation reported by Hogan and Hogan *(1995)*. This procedure produced an index of range restriction for each HPI scale for each study. Mean replacement within job family was used to estimate range restriction correction factors for each scale when within study standard deviation was unavailable.

Hunter and Schmidt *(1990)* point out that meta-analytic results can be biased unless each sample contributes about the same number of correlations to the total. To eliminate such bias, we averaged correlations within studies so that each sample contributed only one point estimate per predictor scale. For example, if more than one criterion was available for any study, the correlations between each predictor scale and those criteria were averaged to derive a single point estimate of the predictor-criterion relationship. Note that this procedure uses both negative and positive correlations rather than mean absolute values for averaging correlations. This is the major computational difference between the current analyses and those presented by Tett et al. *(1991, p. 712)*. We did not correct correlation coefficients to estimate validity at the construct level. Although some *(e.g., Mount & Barrick, 1995; Ones, Viswesvaran, & Schmidt, 1993)* argue this is a relevant artifact that can be corrected, we believe it is premature to estimate the validity of the perfect construct when there is no firm agreement about the definition of the perfect construct.

Transportability of validity results are presented for each job family in Chapter 5. These results, which are derived from the meta-analytic procedures outlined above, represent true relationships between observed scores on each HPI scale and job performance within each specific job family.

4.5 Synthetic Validity/Job Component Validity

The *Uniform Guidelines* is vague about technical requirements and documentation for synthetic/job component validity as a method for establishing the validity of aselection procedure. However, the *Principles* explicitly includes this strategy as a way to establish the generalized validity of inferences based on test scores. The concept of synthetic validity was introduced by Lawshe *(1952)* over 50 years ago; however, it was largely ignored during the time when people believed that test validity is specific to situations. An exception was an interpretive review and demonstration by Mossholder and Arvey *(1984)*. Drawing on Mossholder and Arvey, the term synthetic validity "describes the logical process of inferring test-battery validity from predetermined validities of the tests for basic work components" *(p. 323)*. If the important components of a job are known, researchers can review previous criterion-related studies that contain those jobs' components and their significant predictors. The valid predictors of job components can be "synthesized" into a valid test battery for the job being considered *(Lawshe, 1952)*. Balma *(1959)* summarized Lawshe's definition stating that synthesis "…is the combination of separate elements into a whole" (p. 395). Operational definitions of the synthetic validity process are available from Primoff *(1959)*, Guion *(1965)*, and McCormick, DeNisi, and Shaw *(1979)*. Hoffman, Holden, and Gale *(2000)*, Jeanneret and Strong *(2003)*, Johnson, Carter, Davison, and Oliver *(2001)*, and McCloy *(1994, 2001)* have published synthetic validity research, and Scherbaum *(2005)* reviews of the field. Brannick and Levine *(2002)* point out that synthetic validity approaches allow us to build up validity evidence from small samples with common job components. The process of synthetic validation proceeds by estimating validity for a current job criterion from previously established predictor-criterion relations. Using synthetic validation to devise a selection battery, evidence can be accumulated at the level of criterion similarity as opposed to job similarity, as in the case of transporting validity.

Synthetic validation is a logical procedure that relies heavily on archival research. The process of establishing synthetic validity proceeds by: (a) identifying the important performance criteria of a job; (b) reviewing previous criterion-related validation research that examines the prediction of each criterion; and (c) aggregating predictor-criterion correlations across multiple studies for the various criteria (components) that compose the job to form a test battery using component validities *(Scherbaum, 2005)*. Mossholder and Arvey *(1984)* corroborate these requirements and summarize their final requirement as follows: "When test battery validity is inferred from evidence showing that tests measure broad characteristics necessary for job performance, the process resembles a construct validation strategy. When scores are correlated with component performance measures, the process involves criterion-related validation. The nature of the tests used in the process (e.g., work sample vs. aptitude) may determine in part the appropriate validational strategy" (p. 323). Subsequent sections of this report describe the job performance criteria (job components) and the validity of the HPI scales for predicting performance criteria across job families. For purposes of this discussion and because the concept of synthetic validity has evolved over 50 years, we use interchangeably the terms criteria, performance dimensions, job components, work components, competencies, and domains of work.

5. VALIDITY GENERALIZATION RESULTS FOR JOB FAMILIES

5.1 Managers & Executives Job Family

Overview of Job Family. The Managers & Executives job family consists of positions that have administrative or managerial authority over the human, physical, and financial resources of an organization. These jobs involve establishing broad policies, planning, forecasting, prioritizing, allocating, and directing work to achieve efficient use of resources at each level of the organization. Personnel who advance into these jobs typically are scientific, professional, or administrative specialists. Hogan distinguishes the following three levels of Managers & Executives:

1. Executive Management – Senior-most business and business unit heads (e.g., Corporate-Levels, Executive Vice Presidents, Senior Vice Presidents, Vice Presidents, General Managers, Directors).

2. Middle Management – Positions with second-level management direct reports and higher (e.g., department heads, business unit heads).

3. Supervisors & Entry-level Management – First-level supervisors and the positions to whom they report (e.g., general supervisor, first-level manager, unit head).

Meta-Analysis Results. Several meta-analyses focus on Managers & Executives as a group. On the basis of data from 146 managers, Barrick and Mount *(1991)* found that Conscientiousness (r = .25) and Extraversion (r = .14), were significantly related to job performance. A previous meta-analysis, Barrick and Mount *(1991)* found similar results, with Conscientiousness (ρ = .22) and Extraversion (ρ = .18) both related to all job performance criteria (i.e., job proficiency, training proficiency, and personnel data) for the managerial group. More recently, Hurtz and Donovan *(2000)* found that job performance in managerial positions could be reliably predicted by Conscientiousness (ρ = .17), Extraversion (ρ = .12), and Emotional Stability (ρ = .12). Focusing on leadership and leadership roles, Judge, Bono, Ilies, and Gerhardt *(2002)* meta-analyzed 222 correlations from 73 samples and found significant correlations for Emotional Stability (ρ = .24), Extraversion (ρ = .31), Openness to Experience (ρ = .24), and Conscientiousness (ρ = .28) measures. They found Extraversion (which includes Ambition) to be the most generalizable measure across samples and criteria. In an examination of Transformational Leadership, Bono and Judge *(2004)* found that Neuroticism (ρ = -.17) and Extraversion (ρ = .24) were predictive of a composit of three leadership dimensions: charisma, intellectual stimulation, and individualized consideration. Zhao and Seibert *(2006)* found that entrepreneurs were higher than managers on Conscientiousness (d = .39) and Openness (d = .36), but lower on Neuroticism (d = -.37) and Agreeableness (d = -.14). Finally, Barrick et al. *(2003)* examined the relationship between the FFM and Holland's RIASEC occupational types. Results for the Enterprising type, which includes managers and executives, indicated that Extraversion measures predicted occupational interests (ρ = .41) concerned with persuading and leading others to reach organizational goals or economic gain.

Together, these analyses suggest that Emotional Stability, Extraversion, Conscientiousness, and Openness to Experience predict performance in the Managers & Executives job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies that included Managers & Executives. Thirty-five studies were identified in the review. These studies are listed in Table 5.1. Each study reported correlations between the personality scales and job performance criteria. The correlations for each scale are aggregated across studies, using meta-analysis to estimate the true relationship between the predictor variables and job performance.

A meta-analytic correlation is the average correlation between a predictor and a criterion across multiple studies and/or samples that has been corrected for statistical artifacts. The rationale for computing a meta-analytic correlation is that differences in observed correlations across studies or samples are usually caused by sampling error, not differences in the job or occupational environment *(Hunter & Schmidt, 1990)*. A meta-analytic correlation minimizes sampling error by weighting observed correlations by sample size within each sample or study, and then averaging the weighted correlation coefficients across multiple samples or studies. This result is then corrected for statistical artifacts. Meta-analysis results in an estimated correlation coefficient that reflects the estimated true validity of a predictor scale across jobs, locations, and industry types.

Table 5.1
Managers & Executives Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
10, 14, 61, 114, 158, 182, 192, 193, 219, 319	Managers
157	Volume Business Managers
157	Specialist Business Managers
83, 103, 175	Store Managers
10	Terminal Managers
67	Managers & Assistants Managers
73	Account Manager at Sales Rep
73	Account Executive at Sales Rep
256	Telemarketing Supervisors
274	Executive Directors
10	Coordinators
118	Facility Administrators
320	Assistant Project Managers
219	Field Sales Managers
278	Restaurant Managers
151, 155	Supervisors
99	Assistant Managers
122	Expatriate Managers in Turkey
309, 324	Management-level Employees
200	Terminal Managers
267	Supervisory Officers
301	Branch Managers

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.2.

Table 5.2
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Managers & Executives Jobs

	HPI Scales								
	N	**K**	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Samples	3,751	35	**.20**	**.29**	.07	**.13**	**.11**	.07	.09

Note. N = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results support those found in the published meta-analysis literature. HPI Adjustment and Ambition are the best predictors of job performance. Interpersonal Sensitivity and Prudence also predict job performance. Finally, although Sociability, Inquisitiveness, and Learning Approach had lower correlations with job performance, the relationships were still positive, suggesting that they might be important for some jobs within the Managers & Executives job family. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leader-like (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Managers and Executives. We combined the validities across personality predictors into a single coefficient representing the link between the predictor battery and total job performance. There are several methods for doing this and they are reviewed by Scherbaum *(2005)*. Peterson, Wise, Arabian, & Hoffman *(2001)* specifically discuss various weighting options for predictor batteries. Although these authors find little difference in the outcomes of the various methods, there are differences in data requirements (e.g., need for job analysis data). The data in the Hogan Archive (i.e., competency ratings) dictated that we use the weighting procedure recommended by Johnson, Carter, and Tippins *(2001)*. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums was used to estimate the overall transportability correlation between the composite of selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Managers and Executives' performance:

$$r_{y_c x_c} = \frac{\overline{r_{y_i x_i}}}{\sqrt{\overline{r_{yy}}}\sqrt{\overline{r_{xx}}}}$$

Based upon transportability of validity results, the overall estimated validity of the test battery is r = .31.

Synthetic Validity/Job Component Validity. Synthetic validity/job component validity procedures permit inferences based on previous studies using the HPI. The process requires: (a) identifying the relevant performance criteria for a job family; (b) reviewing previous criterion-related validation research; and (c) aggregating predictor-criterion correlations across multiple studies for the various criteria that compose the job family.

The Managers & Executives competency model developed by Hogan was used to identify the relevant performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for the HPI scales across performance criteria, are presented in Table 5.3.

The results indicate that Adjustment, Ambition, Interpersonal Sensitivity, and Prudence scales predict performance in Managers & Executives job family. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Maintaining Optimism, Ambition and Persuading Others, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized.

This evidence supports the use of the HPI Adjustment, Ambition, Interpersonal Sensitivity, and Prudence scales to predict performance. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leader-like (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Managers and Executives. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation between the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Managers and Executives' performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .25$.

Table 5.3

HPI Scale Synthetic Validity/Job Component Validity for Managers & Executives Job Family Competencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Leading Organizational Action									
Setting Strategic Vision	1	50	.04	.06	.02	-.08	**.29**	**-.14**	–
Showing Entrepreneurial Acumen	1	89	**.46**	**.51**	**.10**	**.30**	**.17**	**.25**	-.06
Sponsoring Change	1	44	.07	**.19**	**-.24**	**.14**	**.33**	**-.37**	-.07
Growing Organizational Capability	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 2 – Exercising Business Skills									
Implementing Business Strategies	26	3,947	**.17**	**.32**	.09	.08	**.13**	**.14**	**.13**
Planning and Organizing	22	2,166	**.11**	**.14**	.01	.06	**.14**	-.01	.04
Allocating and Leveraging Resources	3	381	**-.16**	**.32**	**.33**	.00	-.06	**.25**	-.03
Demonstrating Technical Capabilities	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Communicating Business Concepts	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Category 3 – Solving Problems and Making Decisions									
Using Industry and Org. Knowledge	11	1,179	**.15**	**.14**	-.01	.05	.00	.08	.04
Using Creative Problem Solving	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Dealing with Complexity	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Category 4 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Persuading Others	6	1,063	**.25**	**.38**	**.21**	**.25**	**.18**	.05	.02
Negotiating	6	1,063	**.25**	**.38**	**.21**	**.25**	**.18**	.05	.02
Teaming with Others	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Building Alliances	7	435	**.17**	**.15**	.02	**.10**	.08	.06	.09
Category 5 – Managing & Developing People									
Delegating and Monitoring Assignments	1	290	**.35**	**.17**	**-.16**	**.12**	.04	.02	.09
Building and Coaching Teams	4	342	**.31**	**.24**	-.02	**.24**	**.23**	.06	-.02
Developing and Supporting People	10	1,414	.06	**.29**	**.16**	**.14**	.09	**.10**	.03
Category 6 – Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Maintaining Optimism	15	1,820	**.36**	**.15**	**-.11**	**.12**	**.22**	-.03	**.13**
Driving for Results	48	4,496	.09	.20	.00	.03	.07	.02	.04
Category 7 – Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Pursuing Self-Development	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

Recommendations and Cutoff Scores. This report presents evidence for using HPI scales in the selection process for the Managers & Executives job family. Four HPI scales are appropriate for candidate evaluation. They are Adjustment (being calm and stable), Ambition (being competitive and achievement-oriented), Prudence (being conscientious and rule-following), and Interpersonal Sensitivity (being friendly and agreeable). Based on these results, recommended cutoff scores for the Managers & Executives job family are specified in Table 5.4.

Table 5.4
Recommended Cutoff Scores for Managers & Executives Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 39
Ambition		≥ 33
Prudence		≥ 34
Interpersonal Sensitivity		≥ 39
Expected Pass Rates		73.9%

Simulated Adverse Impact. Hogan evaluated selection rates for various gender, age, and race/ethnic groups using a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.5 shows effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are considered the majority groups. Based on the *Uniform Guidelines* 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.5
Selection Rates and Adverse Impact for Managers & Executives Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,284	28.4%	3,239	71.6%	
Sex	Men	644	28.0%	1,659	72.0%	
	Women	464	29.3%	1,119	70.7%	No A.I.
Age	< 40	184	26.9%	501	73.1%	
	≥ 40	64	24.2%	200	75.8%	No A.I.
Race	Black	135	27.7%	352	72.3%	No A.I.
	Hispanic	71	28.1%	182	71.9%	No A.I.
	Asian Am./P.I.	79	31.9%	169	68.1%	No A.I.
	Am. Indian/A.N.	17	21.0%	64	79.0%	No A.I.
	White	628	27.9%	1,621	72.1%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Managers & Executives job family, as shown in Table 5.6. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.6 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.6
Recommended Pass-Plus Cutoff Scores for Managers & Executives Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 39	≥ 66
Ambition		≥ 33	≥ 64
Prudence		≥ 34	58 ≥ ≤ 96
Interpersonal Sensitivity		≥ 39	≥ 60
Expected Pass Rates	73.9%	32.1%	

5.2 Professionals Job Family

Overview of Job Family. The Professionals job family consists of occupations concerned with theoretical and applied aspects of such fields as art, science, engineering, education, medicine, law, computer science, business relations, and other technical specializations. Professional employees may have little supervisory or managerial responsibility; however, these positions generally require substantial educational preparation for professional practice. Personnel who advance in these jobs are experts in their field and usually have a high level of training and experience. Hogan distinguishes the following three levels of Professionals:

1. Senior Professionals – Senior-most, non-management contributors with advanced post-graduate degrees, specialized expertise, related credentialing, and substantial work experience (e.g., senior scientists, physicians, researchers, R&D consultants, attorneys, consultant advisors).

2. Mid-Level Professionals – Positions that require a college degree, along with special training, credentialing, and prior job experience; a post-graduate degree might be required. These positions are generally equivalent in compensation to mid-level managers, but focus on a specific professional discipline (e.g., engineering, law, medicine, accounting, finance, marketing, human resources, IT, education).

3. Entry-Level Professionals - Positions that require a college degree, special training, or credentialing requirements; little prior work experience required.

Meta-Analysis Results. A number of meta-analyses focus on Professionals as a group. Barrick and Mount *(1991)* found that Conscientiousness (ρ = .20) was significantly related to job proficiency in data collected from over 700 individuals in six different professional positions. Salgado *(1997)* found that both Emotional Stability (ρ = .43) and Agreeableness (ρ = .14) measures were related to job performance for professionals. In reviewing results from individual job samples, Borman, Penner, Allen, and Motowidlo *(2001)* found that scales for both Agreeableness (r = .20) and Extraversion (r = .29) were related to job performance in a sample of 116 insurance representatives. Barrick et al. *(2003)* found that Conscientiousness (ρ = .07), Emotional Stability (ρ = .12), and Openness (ρ = .25) measures were significantly related to the Investigative Holland RIASEC job type, which is characterized by occupational interests in solving problems and being inquisitive, curious, independent, and rational. Finally, Hogan and Holland *(2003)* found that both HPI Ambition (ρ = .20) and Inquisitive (ρ = .29) were significantly related to components of job performance that involve solving problems, analyzing information, and achieving quality using information.

Together, these analyses suggest that Conscientiousness, Emotional Stability, Agreeableness, Extraversion, and Openness predict performance in the Professionals job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies involving Professionals. Twelve studies were identified in the review. These studies are listed in Table 5.7. Two of these studies overlapped with managerial level positions that were included in the validity analysis computed for the Managers & Executives job family. Because job analysis results for both jobs indicated a significant portion of the positions' roles and responsibilities included professional activities, the studies were included in transportability of validity analyses for Professionals. Table 5.8 reports correlations between scales and job performance criteria with the correlations for each scale aggregated across studies, using meta-analysis.

Table 5.7
Professionals Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
172	Auditors
84	Trading Assistants
71	Licensed Practical Nurses
168	Recreation Leaders
174	Trading Assistants
77	Marketing Personnel
78	Insurance Personnel
182	Manager
301	Loan Officers
320	Assistant Project Managers
101	Small Business Bankers
326	Financial Specialists

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.8.

Table 5.8
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Professionals Jobs

	HPI Scales								
	N	***K***	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Samples	1,149	12	**.14**	**.12**	-.04	.09	.08	.00	.01

Note. *N* = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results are consistent with those reported in the published meta-analysis literature. HPI Adjustment and Ambition are the most significant predictors of job performance. Interpersonal Sensitivity and Prudence have small positive relationships with job performance for Professionals. It is likely that these characteristics will be more important for positions that involve interactions and procedures than positions where professionals are working alone with little job structure. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment) and energetic and leaderlike (HPI Ambition) are characteristics important to successful performance for Professionals. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment and Ambition) and Professionals' performance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .19$.

Synthetic Validity/Job Component Validity. The Professionals competency model developed by Hogan was used to identify the relevant performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for the HPI scales across performance criteria, are presented in Table 5.9.

Table 5.9
HPI Scale Synthetic Validity/Job Component Validity for Professionals Job FamilyCompetencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Delivering Professional Expertise									
Demonstrating Technical Capabilities	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Building Credibility	44	4,907	**.17**	.06	-.06	.06	**.14**	-.03	.02
Translating Skills into Action	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Growing Organizational Capability	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 2 – Exercising Business Skills									
Planning and Organizing	22	2,166	**.11**	**.14**	.01	.06	**.14**	-.01	.04
Allocating and Leveraging Resources	3	381	**-.16**	**.32**	**.33**	.00	-.06	**.25**	-.03
Exercising Business Acumen	1	89	**.46**	**.51**	**.10**	**.30**	**.17**	**.25**	-.06
Presenting Ideas Clearly	51	5,225	**.11**	**.13**	.03	.10	**.07**	.04	.05
Category 3 – Solving Problems and Making Decisions									
Seeking Out Information	26	3,947	**.17**	**.32**	.09	.08	**.13**	**.14**	**.13**
Analyzing Information Creatively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Dealing with Complexity	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Category 4 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Impacting and Influencing Others	6	1,063	**.25**	**.38**	**.21**	**.25**	**.18**	.05	.02
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Demonstrating Organizational Savvy	3	439	**.27**	**.15**	.02	**.21**	**.16**	-.09	.05
Category 5 – Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	.14	.03	.00
Maintaining Optimism	15	1,820	**.36**	**.15**	**-.11**	**.12**	**.22**	-.03	**.13**
Driving for Results	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 6 – Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Pursuing Self-Development	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in Professional jobs. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Maintaining Optimism, Ambition and Impacting and Influencing Others, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Professionals. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Professionals' performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .24$.

Recommendations and Cutoff Scores. This report presents evidence for using HPI scales in selection for Professional jobs. Five HPI scales are appropriate for candidate evaluation. They are Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Interpersonal Sensitivity (being friendly and agreeable), Prudence (being conscientious and rule-following), and Inquisitive (being curious and visionary). Based on these results, recommended cutoff scores for the Professionals job family are specified in Table 5.10.

Table 5.10
Recommended Cutoff Scores for Professionals Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 39
Ambition		≥ 33
Interpersonal Sensitivity		≥ 16
Prudence		≥ 34
Inquisitive		≥ 17
Expected Pass Rates		75.0%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and race/ethnic groups using a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.11 shows effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are considered the majority groups. Based on the *Uniform Guidelines* 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.11
Selection Rates and Adverse Impact for Professionals Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,178	26.0%	3,345	74.0%	
Sex	Men	580	25.2%	1,723	74.8%	
	Women	433	27.4%	1,150	72.6%	No A.I.
Age	< 40	173	25.3%	512	74.7%	
	> 40	59	22.3%	205	77.7%	No A.I.
Race	Black	128	26.3%	359	73.7%	No A.I.
	Hispanic	73	28.9%	180	71.1%	No A.I.
	Asian Am./P.I.	71	28.6%	177	71.4%	No A.I.
	Am. Indian/ A.N.	13	16.0%	68	84.0%	No A.I.
	White	566	25.2%	1,683	74.8%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Professional job family, as shown in Table 5.12. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.12 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.12
Recommended Pass-Plus Cutoff Scores for Professionals Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 39	≥ 66
Ambition		≥ 33	≥ 74
Interpersonal Sensitivity		≥ 16	≥ 60
Prudence		≥ 34	≥ 67
Inquisitive		≥ 17	≥ 46
Expected Pass Rates	75.0%	28.8%	

5.3 Technicians & Specialists Job Family

Overview of Job Family. The Technicians & Specialists job family consists of positions in which employees work to solve practical problems encountered in fields of specialization (e.g., engineering, machine trades, processing, etc.). These jobs require specialized knowledge and skills to perform activities directed by a professional. Personnel who work in these occupations usually complete two years of college, technical school, or thorough on-the-job training certification. Hogan distinguishes between technicians and specialists:

1. Technicians – Positions that typically do not require a college degree, but may involve associates-level, trade, vocational, or other school training (e.g., service and repair, installation and set-up, information collection, data basing jobs, specialized equipment operators).

2. Specialists - Positions that typically require a college degree in a specific area of study. (e.g., bookkeeping, IT specialties, drafting, engineering, healthcare specialists, paralegal, public safety).

Meta-Analysis Results. Several meta-analyses focus on Technicians & Specialists as an occupational group. Barrick and Mount *(1991)*, in looking at skilled and/or semi-skilled positions, found that Conscientiousness (ρ = .21) was significantly related to job performance. Similar results were reported by Hurtz and Donovan *(2000)*, who indicated that Conscientiousness (ρ = .17) was related to performance for skilled/semi-skilled employees. Along with Conscientiousness (ρ = .23), Salgado *(1997)* found that Emotional Stability (ρ = .25) and Openness (ρ = .17) were significant predictors of job performance for skilled labor. Finally, Hogan and Holland *(2003)* found that HPI Adjustment (ρ = .17), Ambition (ρ = .22), Prudence (ρ = .14), and Learning Approach (ρ = .22) scales were significantly related to components of job performance for exhibiting technical skill and possessing job specific knowledge.

Together, these analyses suggest that Conscientiousness, Emotional Stability, Extraversion, and Openness predict performance in the Technicians & Specialists job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies involving Technicians & Specialists jobs. Thirteen studies were identified in the review and these are listed in Table 5.13. Each study reported correlations between scales and job performance criteria with the correlations for each scale aggregated across studies, using meta-analysis.

Table 5.13
Technicians & Specialists Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
8, 117, 124, 169, 241	Mechanics
69	Installers/Assemblers
126	Offshore Anchor Handlers (Riggers)
185	Engineer Trainees, Field Training
199	Information Technical Employees
185	Engineer Trainees, Classroom Training
247	Field Service Technicians
288	Field Service Representatives
107	Field Representatives

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.14.

Table 5.14
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Technicians & Specialists Jobs

	HPI Scales								
	N	**K**	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Samples	2,207	13	**.22**	**.18**	-.07	**.11**	**.19**	.04	.05

Note. N = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results support those found in the published meta-analysis literature. HPI Adjustment, Ambition, and Prudence scales predict job performance. The negative correlations associated with Sociability also suggest that this scale could be used to predict job performance for some Technician & Specialist positions, although lower scores on this scale are associated with higher levels of job performance. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Technicians and Specialists. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity and Prudence) and Technicians and Specialists' performance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .30$.

Synthetic Validity/Job Component Validity. The Technicians & Specialists competency model developed by Hogan was used to identify the relevant performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for each personality scale across critical supervisory performance criteria, are presented in Table 5.15.

Table 5.15
HPI Scale Synthetic Validity/Job Component Validity for Technicians & Specialists Job FamilyCompetencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INT	PRU	INQ	LRN
Category 1 - Demonstrating Technical Skills									
Delivering Technical Expertise	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Translating Skills into Action	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Presenting Ideas Clearly	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Showing Personal Productivity	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Building Organizational Awareness	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Category 2 - Solving Problems and Making Decisions									
Seeking Out Information	26	3,947	**.17**	**.32**	.09	.08	**.13**	**.14**	**.13**
Analyzing Information Creatively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Dealing with Concepts	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Category 3 - Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Showing Interpersonal Understanding	5	822	**.36**	**.13**	-.08	**.23**	**.23**	.05	.02
Impacting and Influencing Others	6	1,063	**.25**	**.38**	**.21**	**.25**	**.18**	.05	.02
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Category 4 - Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Showing Flexibility	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Driving for Results	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 5 - Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Pursuing Self-Development	10	1,414	.06	**.29**	**.16**	**.14**	.09	**.10**	.03
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in the Technician & Specialist job family. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Showing Emotional Maturity, Ambition and Impacting and Influencing Others, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leader-like (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Technicians and Specialists. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Technicians and Specialists' performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .23$.

Recommendations and Cutoff Scores. This report presents evidence for using HPI scales in selection for Technicians & Specialists jobs. Four HPI scales are appropriate for candidate evaluation. They are Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Prudence (being conscientious and rule-following), and Learning Approach (being concerned with learning and education). Based on these results, recommended cutoff scores for Technicians & Specialists jobs are specified in Table 5.16.

Table 5.16
Recommended Cutoff Scores for Technicians & Specialists Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 39
Ambition		≥ 33
Prudence		≥ 34
Learning Approach		≥ 36
Expected Pass Rates		71.6%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and ethnic groups using a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.17 shows effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are considered to be the majority groups. Based on the Uniform Guidelines 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.17
Selection Rates and Adverse Impact for Technicians & Specialists Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,318	29.1%	3,205	70.9%	
Sex	Men	698	30.3%	1,605	69.7%	
	Women	455	28.7%	1,128	71.3%	No A.I.
Age	< 40	178	26.0%	507	74.0%	
	≥ 40	63	23.9%	201	76.1%	No A.I.
Race	Black	128	26.3%	359	73.7%	No A.I.
	Hispanic	78	30.8%	175	69.2%	No A.I.
	Asian Am./P.I.	73	29.4%	175	70.6%	No A.I.
	Am. Indian/A.N.	18	22.2%	63	77.8%	No A.I.
	White	677	30.1%	1,572	69.9%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Technicians & Specialists job family, as shown in Table 5.18. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.18 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.18
Recommended Pass-Plus Cutoff Scores for Technicians & Specialists Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 39	≥ 72
Ambition		≥ 33	≥ 55
Prudence		≥ 34	≥ 67
Learning Approach		≥ 36	≥ 79
Expected Pass Rates		71.6%	30.7%

5.4 Operations & Trades Job Family

Overview of Job Family. The Operations & Trades job family consists of occupations that include craft workers (skilled), operatives (semi-skilled), and laborers (unskilled) whose job knowledge and skills are primarily gained through on-the-job training and experience; little prerequisite knowledge or skill is needed to enter these jobs.

Meta-Analysis Results. Meta-analyses for the Operations & Trades job family are similar to those for Technicians & Specialists. The consistencies are because: (a) most previous work in this area focuses on both skilled and semi-skills employees as one group, which encompasses positions in both Operations & Trades and Technicians & Specialists job families; and (b) although the level of expertise and training required for positions within each family may differ, there is considerable overlap in the personality-based requirements and primary duties performed in both job families. Consequently, meta-analysis results presented for Technicians & Specialists are also applied to Operations & Trades jobs.

Several meta-analyses focus on skilled and semi-skilled jobs as a group. Barrick and Mount *(1991)* found that Conscientiousness (ρ = .21) was significantly related to job performance. Hurtz and Donovan *(2000)* found similar results where Conscientiousness (ρ = .17) predicts job performance for skilled/semi-skilled employees. Along with Conscientiousness (ρ = .23), Salgado *(1997)* found that Emotional Stability (ρ = .25) and Openness (ρ = .17) were significant predictors of job performance for skilled labor. Finally, Hogan and Holland *(2003)* reported that HPI Adjustment (ρ = .17), Ambition (ρ = .22), Prudence (ρ = .14), and Learning Approach (ρ = .22) scales were significantly related to components of job performance concerning "exhibiting technical skill" and "possessing job specific knowledge."

These analyses suggest that Conscientiousness, Emotional Stability, Extraversion, and Openness predict performance in the Operations & Trades job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies involving Operations & Trades. Forty-four studies were identified in the review. These studies are listed in Table 5.19. Each study reported correlations between scales and job performance criteria with the correlations for each scale aggregated across studies, using meta-analysis.

Table 5.19
Operations & Trade Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
56, 58, 60, 62, 64, 76, 90, 91, 94, 96, 104, 110, 111, 116, 129, 134, 140, 148, 181, 209, 242	Drivers
60	Warehousers
65	Mechanic Operators
60	Loaders
270	Owner Operators
124	Road Drivers
124	City Drivers
112	Freight Handlers
330	Entry Level Factory Workers
280	Regional Drivers
11	Line Haul Drivers
130	Dock Workers
214	Crewmen
311, 323	Truck Drivers
244	Surfacing & Coating Employees
162	Utility & Service Personnel
124	Jockey
136	Pipe Manufacturing Workers
247, 288	Delivery Service Representatives
79	Machine Operators
102	Drivers & Delivery/Installation Service
203	Bus Operators

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.20.

Table 5.20
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Operations & Trades Jobs

	HPI Scales								
	N	***K***	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Studies	3,021	44	**.27**	**.14**	.00	**.11**	**.18**	.03	.05

Note. N = number of participants across K studies; K = number of studies. ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results support those found in the published meta-analysis literature. HPI Adjustment and Prudence are the best predictors of job performance. Ambition and Interpersonal Sensitivity also have positive relations with job performance in Operations & Trades jobs. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Operations and Trades. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Operations and Trades' performance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .30$.

Synthetic Validity/Job Component Validity. The Operations & Trades competency model developed by Hogan was used to identify relevant performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using a meta-analysis. These correlations, which represent validities for each personality scale across performance criteria, are presented in Table 5.21.

Table 5.21
HPI Synthetic Validity/Job Component Validity for Operations & Trades Job FamilyCompetencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Demonstrating Technical Skills									
Applying Job Skills	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Showing Personal Productivity	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Focusing on Safety	6	471	**.21**	**.27**	.01	**.12**	**.21**	.08	.01
Category 2 – Solving Problems and Making Decisions									
Analyzing Information Effectively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Troubleshooting and Solving Problems	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Learning from Experience	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Category 3 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Showing Interpersonal Understanding	5	822	**.36**	**.13**	-.08	**.23**	**.23**	.05	.02
Communicating Effectively	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Category 4 – Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Showing Concern for Quality	6	991	**.24**	**.12**	-.02	**.11**	**.24**	**.10**	**.15**
Category 5 – Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Adapting to Change	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in Operations & Trades jobs. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Showing Emotional Maturity, Ambition and Showing Personal Productivity, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Operations and Trades. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, and Prudence) and Operations and Trades' performance. Based upon the synthetic validity results, the overall estimated validity of the test battery is $r = .23$.

Recommendations and Cutoff Scores. This report presents accumulated validity evidence for using HPI scales in selection for Operations & Trades jobs. Four HPI scales are appropriate for candidate evaluation. These measures are HPI Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Prudence (being conscientious and rule-following), and Learning Approach (being concerned with learning and education). Based on these results, recommended cutoff scores for Operations & Trades jobs are specified in Table 5.22.

Table 5.22
Recommended Cutoff Scores for Operations & Trades Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 39
Ambition		≥ 33
Prudence		≥ 42
Learning Approach		≥ 27
Expected Pass Rates		72.2%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and race/ethnic groupsusing a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.23 shows the effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are the majority groups. Based on the *Uniform Guidelines* 80% rule-of- thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.23
Selection Rates & Adverse Impact for Operations & Trades Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,365	30.2%	3,158	69.8%	
Sex	Men	691	30.0%	1,612	70.0%	
	Women	496	31.3%	1,087	68.7%	No A.I.
Age	< 40	193	28.2%	492	71.8%	
	> 40	71	26.9%	193	73.1%	No A.I.
Race	Black	150	30.8%	337	69.2%	No A.I.
	Hispanic	77	30.4%	176	69.6%	No A.I.
	Asian Am./P.I.	69	27.8%	179	72.2%	No A.I.
	Am. Indian/A.N.	16	19.8%	65	80.2%	No A.I.
	White	692	30.8%	1,557	69.2%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Operations & Trades job family, as shown in Table 5.24. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.24 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.24
Recommended Pass-Plus Cutoff Scores for Operations & Trades Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 39	≥ 72
Ambition		≥ 33	≥ 64
Prudence		≥ 42	≥ 75
Learning Approach		≥ 27	≥ 58
Expected Pass Rates		72.2%	32.4%

5.5 Sales & Customer Support Job Family

Overview of Job Family. The Sales & Customer Support job family consists of positions in which employees are responsible for selling and/or supporting products and services through interaction with prospects and clients using knowledge of the industry product. These employees rely on their interpersonal skills and communication techniques to sell products or services that meet customers' needs.

They provide courteous and helpful service to customers after the sale. Hogan distinguishes the following three levels of Sales & Customer Support:

1. Senior Sales Executives – Positions that involve the handling of clients of major size and sensitivity, managing national or key accounts, or contributing to sales strategy. The positions may involve sales management responsibilities, but the primary focus is on managing large-scale relationships, ensuring continued sales with major customers, and finding additional, new major sales opportunities. College education, substantial experience, and substantial sales training are typically required.

2. Sales Professionals – Positions that involve all features of the sales process, from prospecting, to lead qualification, making sales presentations, follow through on opportunities, and closing sales. These positions typically involve face-to-face customer contact, but may include some higher-level telephone prospecting as well. This level may, or may not, require college education, but typically involves substantial company-specific sales training.

3. Telemarketers & Customer Support – Positions that handle either inbound or outbound customer contact for purposes of making sales, taking orders, handling service problems, or answering questions. Also included are positions in the service and retail trades, where the employee provides limited advice, sales support, service, and transaction processing face-to-face.

Meta-Analysis Results. Several meta-analyses focus on Sales & Customer Support as an occupational group. Barrick and Mount *(1991)* found that Conscientiousness (ρ = .23) was significantly related to job performance. Salgado *(1997)* reported that Conscientiousness (ρ = .18) was related to performance, but also found a negative relationship between Emotional Stability and performance (ρ = -.07) for Sales and Customer Support positions. Hurtz and Donovan *(2000)* examined Sales and Customer Service positions as two separate groups; they found Conscientiousness (ρ = .26), Emotional Stability (ρ = .13), and Extraversion (ρ = .15) predict Sales performance, while Conscientiousness (ρ = .27), Emotional Stability (ρ = .12), Agreeableness (ρ = .17), and Openness (ρ = .15) predict Customer Service performance. Based on these meta-analyses and three additional ones, Barrick, Mount, and Judge *(2001)* replicated previous results in a second-order meta-analysis showing Conscientiousness predicts performance in Sales & Customer Service as a job group. Borman et al. *(2001)* found that Conscientiousness (r = .23) predicted performance in a Mexican sample of customer service and sales representatives (N = 103), while both Conscientiousness (r = .23) and Agreeableness (r = .21) predicted "courtesy" ratings for sales clerks (*N* = 284). Finally, Barrick et al. *(2003)* examined the relationship between the FFM and Holland's RIASEC occupational types. Results for the Enterprising type, which includes sales, indicated that Extraversion predicted occupational interests (ρ = .41) concerned with financial gains, influencing people, and being sociable.

Together, these analyses suggest that Conscientiousness, Extraversion, Agreeableness, Emotional Stability, and Openness predict performance in the Sales & Customer Support job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies involving Sales & Customer Support jobs. Forty-eight studies were identified in the review. These studies are listed in Table 5.25. Each study reported correlations between scales and job performance criteria with the correlations for each scale aggregated across studies, using meta-analysis.

Table 5.25
Sales & Customer Support Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
60	Merchandisers
256, 263	Telephone Sales Representatives
19, 20, 88, 135	Telemarketers
190	Customer Service Operator
125	International Relocation Consultants
20, 91, 99, 102, 109, 131, 138, 149, 162, 165, 171	CSRs
216	Sales
83	Part Time Sales
60	Parts Specialists
70	Service Operations Coordinators
276	Customer Operations
179	Sales Associates
152	Sales Persons
7, 75, 196, 265, 319, 325	Sales Representatives
86	Customer Operations Representatives
123	Service Operation Coordinators
19	Account Executives
103	Financial Sales
66	Financial Consultants
297	NBA Sales
310	Account Managers
297	Consumer Sales
138	Customer and Policy Service
297	Care Employees
173	Termite Inspectors
121	Sales/Service Technicians
95	Sales and Service Technician
20, 219	Field Sales

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.26.

Table 5.26
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Sales & Customer Support Jobs

	HPI Scales								
	N	***K***	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Studies	3,740	48	**.10**	**.17**	.07	.08	.06	.06	.06

Note. N = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results support those found in the published meta-analysis literature. HPI Adjustment and Ambition predict job performance. Sociability, Interpersonal Sensitivity, Prudence, Inquisitive, and Learning Approach have positive relationships with job performance, although their particular predictive contribution may be moderated by the type of sales or customer service position an organization seeks to fill. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment) and energetic and leaderlike (HPI Ambition) are characteristics important to successful performance for Sales & Customer Support jobs. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment and Ambition) and Sales and Customer Service performance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .20$.

Synthetic Validity/Job Component Validity. The Sales & Customer Support competency model developed by Hogan was used to identify the relevant performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for the HPI scales across performance criteria, are presented in Table 5.27.

Table 5.27

HPI Synthetic Validity/Job Component Validity for Sales & Customer Support Job Family Competencies

Criterion	K	N	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Creating Sales Results									
Prospecting with Insight	24	2,981	**.16**	**.24**	.05	.14	.06	.06	**.10**
Demonstrating Product and Service Knowledge	11	1,179	**.15**	**.14**	-.01	.05	.00	.08	.04
Building Credibility	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03
Showing Personal Productivity	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 2 – Exercising Business Skills									
Implementing Sales Strategies	24	2,981	**.16**	**.24**	.05	**.14**	.06	.06	.10
Leveraging Resources	3	381	-.16	**.32**	**.33**	.00	-.06	**.25**	-.03
Demonstrating Business Acumen	1	89	**.46**	**.51**	**.10**	**.30**	**.17**	**.25**	-.06
Presenting Ideas Clearly	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Category 3 – Solving Problems and Making Decisions									
Using Industry and Organizational Knowledge	11	1,179	**.15**	**.14**	-.01	.05	.00	.08	.04
Analyzing Information Creatively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Dealing with Complexity	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Category 4 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Impacting and Influencing Others	6	1,063	**.25**	**.38**	.21	**.25**	**.18**	.05	.02
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Demonstrating Organizational Savvy	3	439	**.27**	**.15**	.02	**.21**	**.16**	-.09	.05
Category 5 – Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Demonstrating Resilience and Persistence	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Driving for Results	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Category 6 – Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Pursuing Self-Development	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that HPI Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in the Sales & Customer Support job family. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Maintaining Optimism, Ambition and Persuading Others, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evi-

dence suggests that being calm and self-confident (HPI Adjustment); energetic and leader-like (HPI Ambition); perceptive and tactful (HPI Interpersonal Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Sales and Customer Support jobs. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, Interpersonal Sensitivity, and Prudence) and Sales and Customer Support performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .23$.

Recommendations and Cutoff Scores. This report presents evidence for using HPI scales in selection for the Sales & Customer Support job family. Four HPI scales are appropriate for candidate evaluation. They are Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Interpersonal Sensitivity (being friendly and agreeable), and Prudence (being conscientious and rule-following). Based on these results, recommended cutoff scores for Sales & Customer Support are specified in Table 5.28.

Table 5.28
Recommended Cutoff Scores for Sales & Customer Support Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 34
Ambition		≥ 40
Interpersonal Sensitivity		≥ 26
Prudence		≥ 34
Expected Pass Rates		74.8%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and race/ethnic groupsusing a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.29 shows the effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are the majority groups. Based on the *Uniform Guidelines* 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.29
Selection Rates & Adverse Impact for Sales & Customer Support Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,179	26.1%	3,344	73.9%	
Sex	Men	582	25.3%	1,721	74.7%	
	Women	436	27.5%	1,147	72.5%	No A.I.
Age	< 40	173	25.3%	512	74.7%	
	> 40	59	22.3%	205	77.7%	No A.I.
Race	Black	124	25.5%	363	74.5%	No A.I.
	Hispanic	67	26.5%	186	73.5%	No A.I.
	Asian Am./P.I.	68	27.4%	180	72.6%	No A.I.
	Am. Indian/A.N.	16	19.8%	65	80.2%	No A.I.
	White	584	26.0%	1,665	74.0%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Sales & Customer Support job family, as shown in Table 5.30. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.30 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.30
Recommended Pass-Plus Cutoff Scores for Sales & Customer Support Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 34	44 ≥ ≤ 98
Ambition		≥ 40	≥ 74
Interpersonal Sensitivity		≥ 26	39 ≥ ≤ 83
Prudence		≥ 34	≥ 58
Expected Pass Rates		74.8%	26.1%

5.6 Administrative & Clerical Job Family

Overview of Job Family. The Administrative & Clerical job family consists of positions in which employees plan, direct, or coordinate supportive services as well as prepare/compile documents, compute accounts, and maintain records/files of an organization. These employees engage in variety of non-manual activities that can include maintaining records, distributing mail, handling information requests, operating telephone equipment, preparing correspondence, arranging conference calls, scheduling meetings, and providing other office support services.

Meta-Analysis Results. Few meta-analyses focus on Administrative & Clerical jobs as a group. Barrick et al. *(2003)* found that Conscientiousness (ρ = .19) was significantly related to the Conventional Holland RIASEC job type, which is characterized by occupational interests in clerical duties, organization, and being practical and thrifty. Hogan and Holland *(2003)* found that HPI Adjustment (ρ = .28) and Prudence (ρ = .36) predicted job performance components relating to "staying organized" and "abiding by organizational rules."

These analyses suggest that Emotional Stability and Conscientiousness predict performance in the Administrative & Clerical job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies involving Administrative & Clerical jobs. Fifteen studies were identified in the review. These studies are listed in Table 5.31. Each study reported correlations between scales and job performance criteria with the correlations for each scale aggregated across studies, using meta-analysis.

Table 5.31
Administrative & Clerical Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
63, 127	Certified Nursing Assistants
125	International Relocation Assistants
114	Administrative Personnel
114	Clerical Employees
2	Nursing Aides
138	Document Processor
138	Data Entry & Mailroom Positions
167	Clerical Workers
138	Data Entry Operator
142	Office Clerks
33	Claims Examiners
37	Clerical Workers
164	Auditor and Claims Examiner
137	Entry Level Administrative

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.32.

Table 5.32
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Administrative & Clerical Jobs

	HPI Scales								
	N	***K***	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Studies	920	15	**.18**	.03	-.04	.03	**.15**	.00	.07

Note. N = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results support those found in the published meta-analysis literature. HPI Adjustment and Prudence scales predicted job performance for positions in the Administrative & Clerical job family. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment) and dependable and organized (HPI Prudence) are characteristics important to successful performance in Administrative and Clerical jobs. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment and Prudence) and Administrative and Clerical performance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .23$.

Synthetic Validity/Job Component Validity. The Administrative & Clerical competency model developed by Hogan was used to identify important performance criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for each personality scale across critical supervisory performance criteria, are presented in Table 5.33.

Table 5.33
HPI Synthetic Validity/Job Component Validity for Administrative & Clerical Job FamilyCompetencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Exercising Job Skills									
Applying Job Skills	29	2,546	.06	**.14**	-.04	-.04	.05	.04	.06
Showing Personal Productivity	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Using Knowledge of the Organization	11	1,179	**.15**	**.14**	-.01	.05	.00	.08	.04
Category 2 – Solving Problems and Making Decisions									
Analyzing Information Effectively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Learning from Experience	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Category 3 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Showing Interpersonal Understanding	5	822	**.36**	**.13**	-.08	**.23**	**.23**	.05	.02
Communicating Effectively	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	**.20**	-.03	.05
Category 4 – Showing Drive & Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Showing Concern for Quality	6	991	**.24**	**.12**	-.02	**.11**	**.24**	**.10**	**.15**
Showing Flexibility	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Category 5 – Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that HPI Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in Administrative & Clerical jobs. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Showing Emotional Maturity, Ambition and Showing Personal Productivity, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions is important because it illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Administrative & Clerical jobs. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, and Prudence) and Administrative & Clerical performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .21$.

Recommendations and Cutoff Scores. This report presents accumulated validity evidence for using HPI scales in the selection process for Administrative & Clerical jobs. Four HPI scales are appropriate for candidate evaluation. These measures are HPI Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Interpersonal Sensitivity (being friendly and agreeable), and Prudence (being conscientious and rule-following). Based on these results, recommended cutoff scores for Administrative & Clerical jobs are specified in Table 5.34.

Table 5.34
Recommended Cutoff Scores for Administrative & Clerical Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Moderate Potential Scale	≥ 44
Ambition		≥ 33
Interpersonal Sensitivity		≥ 26
Prudence		≥ 34
Expected Pass Rates		75.2%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and race/ethnic groupsusing a general HPI archival sample (N = 4,523). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.35 shows the effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are the majority groups. Based on the *Uniform Guidelines* 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.35
Selection Rates and Adverse Impact for Administrative & Clerical Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,303	28.8%	3,220	71.2%	
Sex	Men	656	28.5%	1,647	71.5%	
	Women	467	29.5%	1,116	70.5%	No A.I.
Age	< 40	186	27.2%	499	72.8%	
	≥ 40	64	24.2%	200	75.8%	No A.I.
Race	Black	139	28.5%	348	71.5%	No A.I.
	Hispanic	71	28.1%	182	71.9%	No A.I.
	Asian Am./P.I.	80	32.3%	168	67.7%	No A.I.
	Am. Indian/A.N.	15	18.5%	66	81.5%	No A.I.
	White	636	28.3%	1,613	71.7%	

Note. Asian Am/P.I. = Asian Americann/Pacific Islander; Am. Indiaan/A.N. = AmericIndian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Administrative and Clerical job family, as shown in Table 5.36. As cutoffs increase, the level of candidate fit will also increase. Note that the recommendations shown in Table 5.36 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.36
Recommended Pass-Plus Cutoff Scores for Administrative & Clerical Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 44	≥ 78
Ambition		≥ 33	≥ 55
Interpersonal Sensitivity		≥ 26	39 ≥ ≤ 83
Prudence		≥ 34	≥ 58
Expected Pass Rates		75.2%	26.6%

5.7 Service & Support Job Family

Overview of Job Family. The Service & Support job family consists of positions in which employees perform protective (e.g., police, fire fighters, guards) and non-protective (e.g., food service, recreation and amusement, professional and personal service) services for others.

Meta-Analysis Results. A number of meta-analyses focus on Service & Support as an occupational group. Barrick and Mount *(1991)* found that Extraversion (ρ = .09), Emotional Stability (ρ = .10), and Agreeableness (ρ = .10) predict job performance for police officers. Salgado *(1997)* found similar results for Emotional Stability (ρ = .22), Extraversion (ρ = .20), and Agreeableness (ρ = .14) predicting performance for police officers, as well as Conscientiousness (ρ = .39) and Openness (ρ = .18). Barrick et al. *(2003)* found that Extraversion (ρ = .29) and Agreeableness (ρ = .15) were significantly related to the Social Holland RIASEC job type, which is characterized by occupational interests in helping others and being friendly and tactful.

Together, these analyses suggest that Conscientiousness, Emotional Stability, Agreeableness, Extraversion, and Openness predict performance in the Service & Support job family.

Transportability of Validity. The Hogan Archive was searched for HPI validation studies that included Service & Support jobs. Twenty-five studies were identified in the review. These studies are listed in Table 5.37. Each study reported correlations between scales and job performance criteria with correlations for each scale aggregated across studies, using meta-analysis.

Table 5.37
Service & Support Jobs with Criterion-Related Data for Transportability of Validity

Study #	Job Title
92	Cabin Supervisors & Managers
115	Conservation Officers
32	Basic Electronics School Students
20	Office Manager
20	Service Operation Dispatchers
85, 103, 287	Cashiers
170	Emergency Communication Officers
106	Reservation Sales Representative
72	Police Communication Operators
221	Navy Personnel
291	Dispatchers & Supervisors
80	Bank Tellers
166	Sheriff Deputies
220, 349	Fire Fighters and Officers
119, 284	Correctional Officers
120	Deputy Sheriffs
267	Non-Supervisory Officers
81	Police Officers
87	ROTC Students
194	Police Officers
213	Bank Tellers

Note. Study # reference citations appear in Appendix C with (Tech. Rep. No.) designations.

The HPI meta-analytic correlations are presented in Table 5.38.

Table 5.38
Meta-Analytic Correlations between HPI Scales and Performance Criteria for Service & Support Jobs

	HPI Scales								
	N	***K***	**ADJ**	**AMB**	**SOC**	**INP**	**PRU**	**INQ**	**LRN**
Validation Studies	2,372	25	**.15**	.09	.02	**.10**	**.18**	.02	.03

Note. N = number of participants across K studies; K = number of studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

These results supported those found in the published meta-analysis literature. HPI Adjustment, Interpersonal Sensitivity, and Prudence predict job performance. Ambition has a significant positive relationship with job performance, indicating that it may be relevant as a predictor in some Service & Support positions, depending on the specific requirements of those positions. Transportability of validity evidence suggests that being calm and self-confident (HPI Adjustment); perceptive and tactful (HPI Interpersonal

Sensitivity); and dependable and organized (HPI Prudence) are characteristics important to successful performance for Service & Support jobs. To assess the predictive validity of this test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson et al., 2001)* was used to estimate the overall transportability correlation among the composite of the selected HPI scales (i.e., Adjustment, Interpersonal Sensitivity, and Prudence) and Service and Support perfomrance. Based upon transportability of validity results, the overall estimated validity of the test battery is $r = .22$.

Synthetic Validity/Job Component Validity. The Service & Support competency model developed by Hogan was used to the relevant criteria for these positions. For each job component, studies from the Hogan Archive using similar performance criteria were identified, and the correlations from those studies were aggregated using meta-analysis. These correlations, which represent validities for each personality scale across critical supervisory performance criteria, are presented in Table 5.39.

Table 5.39
HPI Synthetic Validity/Job Component Validity for Service & Support Job FamilyCompetencies

Criterion	*K*	*N*	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Category 1 – Demonstrating Technical Skills									
Applying Job Skills	11	1,179	**.15**	**.14**	-.01	.05	.00	.08	.04
Showing Personal Productivity	48	4,496	.09	**.20**	.00	.03	.07	.02	.04
Focusing on Safety	6	471	**.21**	**.27**	.01	**.12**	**.21**	.08	.01
Category 2 – Solving Problems and Making Decisions									
Analyzing Information Effectively	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Troubleshooting and Solving Problems	51	5,940	**.13**	**.12**	-.04	.02	.08	.04	.07
Making Decisions	8	1,105	**.12**	**.20**	**.11**	.06	-.01	**.20**	**.15**
Learning from Experience	20	2,282	.01	**.16**	.00	-.03	.01	**.11**	.05
Category 3 – Building and Maintaining Relationships									
Focusing on the Customer	39	3,840	**.17**	**.11**	.02	**.14**	**.15**	-.03	.00
Showing Interpersonal Understanding	5	822	**.36**	**.13**	-.08	**.23**	**.23**	.05	.02
Communicating Effectively	51	5,225	**.11**	**.13**	.03	**.10**	.07	.04	.05
Teaming and Collaborating	36	4,417	**.19**	.05	-.04	**.13**	.20	-.03	.05
Category 4 – Showing Drive and Motivation									
Exhibiting Motivation and Commitment	49	5,064	.09	.07	.00	.06	**.14**	.03	.00
Showing Concern for Quality	6	991	**.24**	**.12**	-.02	**.11**	**.24**	**.10**	**.15**
Category 5 – Demonstrating Integrity and Professionalism									
Showing Emotional Maturity	52	5,676	**.30**	**.10**	-.04	**.16**	**.19**	.00	.05
Adapting to Change	22	3,126	**.17**	**.21**	.09	**.10**	.06	.08	.09
Acting with Integrity	36	3,660	**.17**	.02	-.05	**.13**	**.24**	-.03	.03

Note. K = Number of Studies; N = Total Sample Size; ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

The results indicate that Adjustment, Ambition, Interpersonal Sensitivity, and Prudence predict performance in the Service & Support job family. Note that the HPI scales best predict dimensions with a similar conceptual foundation (e.g., Adjustment and Showing Emotional Maturity, Ambition and Showing Personal Productivity, Prudence and Acting with Integrity). The convergence of HPI scales and dimensions

illustrates the complimentary nature of HPI scales. By combining HPI scales to create a data-based profile of effectiveness, the likelihood of making accurate human resource decisions is maximized. Synthetic validity evidence suggests that being calm and self-confident (HPI Adjustment); energetic and leaderlike (HPI Ambition); and dependable and organized (HPI Prudence) are characteristics important to successful performance in Service & Support jobs. To assess the predictive validity of the synthetic test battery, Nunnally's *(1978)* correlation of linear sums *(cf. Johnson, et al., 2001)* was used to estimate the overall synthetic correlation among the composite of the selected HPI scales (i.e., Adjustment, Ambition, and Prudence) and Service and Support performance. Based upon synthetic validity results, the overall estimated validity of the test battery is $r = .23$.

Recommendations and Cutoff Scores. This report presents accumulated validity evidence for using HPI scales in the selection process for Service & Support jobs. Based on results from the three validity generalization methods, four HPI scales are specified for candidate evaluation. These measures are Adjustment (being calm and stable), Ambition (being competitive and achievement oriented), Interpersonal Sensitivity (being friendly and agreeable), and Prudence (being conscientious and rule-following). Based on these results, recommend cutoff scores for Service & Support jobs are specified in Table 5.40.

Table 5.40
Recommended Cutoff Scores for Service & Support Jobs

Scale	Low Potential	Moderate Potential (Min. Cutoffs)
Adjustment	Miss on any Average Potential Scale	≥ 39
Ambition		≥ 33
Interpersonal Sensitivity		≥ 39
Prudence		≥ 34
Expected Pass Rates		73.9%

Simulated Adverse Impact. Hogan evaluated selection rates for the various gender, age, and race/ethnic groups using a general HPI archival sample ($N = 4{,}523$). These analyses serve only as estimates of potential selection rates in lieu of actual applicant data. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.41 shows effects of the recommended cutoff scores within the HPI archival sample by demographic group, where men, Whites, and applicants under 40 years of age are the majority groups. Based on the *Uniform Guidelines* 80% rule-of-thumb, these findings suggest that the recommended cutoff scores should not result in adverse impact against any group.

Table 5.41
Selection Rates and Adverse Impact for Service & Support Jobs Using Recommended Cutoff Scores

		Fail	%	Pass	%	A.I. ratio
Total		1,284	28.4%	3,239	71.6%	
Sex	Men	644	28.0%	1,659	72.0%	
	Women	464	29.3%	1,119	70.7%	No A.I.
Age	< 40	184	26.9%	501	73.1%	
	≥ 40	64	24.2%	200	75.8%	No A.I.
Race	Black	135	27.7%	352	72.3%	No A.I.
	Hispanic	71	28.1%	182	71.9%	No A.I.
	Asian Am./P.I.	79	31.9%	169	68.1%	No A.I.
	Am. Indian/A.N.	17	21.0%	64	79.0%	No A.I.
	White	628	27.9%	1,621	72.1%	

Note. Asian Am/P.I. = Asian American/Pacific Islander; Am. Indian/A.N. = American Indian/Alaskan Native

Pass-Plus Decision Guidelines. Hogan recommends pass-plus decision guidelines for selecting strong potential candidates into positions in the Service & Support job family, as shown in Table 5.42. As cutoffs increase, the level of candidate fit will also increase. Note. that the recommendations shown in Table 5.42 are guidelines and should only be used, in conjunction with other available relevant information, to screen qualified candidates.

Table 5.42
Recommended Pass-Plus Cutoff Scores for Service & Support Jobs

Scale	Low Potential	Moderate Potential (Minimum Cutoffs)	High Potential
Adjustment	Miss on any Moderate Potential Scale	≥ 39	≥ 66
Ambition		≥ 33	≥ 55
Interpersonal Sensitivity		≥ 39	60 ≥ ≤ 83
Prudence		≥ 34	≥ 58
Expected Pass Rates		73.9%	28.2%

6. NORMS, USES, AND APPLICATIONS

6.1 Characteristics of the 2005 HPI Norming Sample

Raw test scores hold very little information without appropriate norms to provide context for their interpretation. According to Nunnally *(1967, p. 244)*, "norms are any scores that provide a frame of reference for interpreting the scores of particular persons." Norms provide context and meaning to individual test scores. Tests report norms as either transformed standard scores or percentiles *(Nunnally, 1967)*. The HPI manual *(R. Hogan & Hogan, 1995, 2007)* specifies that the HPI is interpreted using percentile scores. A percentile indicates the percentage of people who score at or below a given raw score on a test. For example, if 85 percent of people have a raw score on Adjustment at or below 33, then any person who receives a raw score of 33 is at the 85th percentile of respondents.

The score distributions for all scales on the HPI have changed slightly since the first publication of norms in 1992. Specifically, the scale means increased over time, resulting in a somewhat skewed distribution of scores. Consequently, personnel selection cutoff scores based on the 1992 norms no longer result in the same pass rates that they did in earlier years. This chapter describes the process undertaken to update the HPI norms. To create norms, the intended population for the test (e.g., schoolchildren or working adults) must be specified. Next, a plan for drawing a representative sample from this population is designed. Then using the plan, a representative sample is drawn from the norming population. Test scores from the sample are aggregated to form a final normative database and these data are used to describe distributions of the test scales and to interpret scores.

Specification of the Population and Sampling Plan. Cronbach *(1984)* noted that the norms for personality inventories are "notoriously inadequate" and emphasized the importance of using appropriate populations when calculating norms. Cronbach listed four standards for developing norms: (a) norming samples must consist of individuals for whom the test was intended and with whom an examinee will be compared; (b) the sample (as weighted) must be representative of the population; (c) the sample must include a sufficient number of cases; and (d) the sample must be appropriately subdivided. The *Standards for Educational and Psychological Testing* also state this in Standard 4.6 *(AERA, APA, & NCME, 1999, p. 55)*:

> *Reports of norming studies should include precise specification of the population that was sampled, sampling procedures, and participation rates, any weighting of the sample, the dates of testing, and descriptive statistics. The information provided should be sufficient to enable users to judge the appropriateness of the norms for interpreting the scores of local examinees. Technical documentation should indicate the precision of the norms themselves.*

The HPI is intended as a tool for assessing working adults in employee selection and development contexts. The target population for the HPI norms is the US workforce. To create a norming sample appropriate for use in both selection and development, a sampling plan used the following three criteria:

- Selection cases included in the norming sample are representative of the US workforce in terms of both occupation and demographics.
- The proportion of selection and development cases included in the norming sample reflects the Hogan client base using an internet delivery platform.
- The overall sample is demographically representative of the US workforce.

Stratified Sampling of the Norming Population. Using the sampling plan, we drew representative norming samples from the Hogan data warehouse. Beginning with a population (N = 624,856) of working adults, data were collected from on-line testing between June 10, 2003 and June 9, 2005. We eliminated cases from this population based on two rules. First, we removed all cases with an HPI Validity scale raw score of less than 10 (See Chapter 2). Applying this rule eliminated 34,059 cases. Second, we removed cases with excessive missing items. The HPI scoring engine eliminated cases with 33% of items, or 68 items, missing data. Following this logic, we eliminated 4,809 cases. After deletions, the norming population included 585,988 cases.

We applied the three sampling plan criteria and derived the final norming sample using both inductive and deductive approaches. We included a proportionate number of cases from the 23 DoL occupational categories, except in categories where we lacked data (i.e., Farming, Fishing and Forestry Occupations). Additionally, because examinees are not required to provide gender and race data, there were some missing data for these variables resulting in a slightly disproportionate representation of the US workforce. To achieve proportionate occupational representation in the norming sample, we mapped our test data to DoL categories. Table 6.1 lists the percentage of people in the US workforce by occupational category, as reported in May 2005 *(US Department of Labor, 2006)*.

We followed the DoL classification guidelines by linking jobs in the norming sample to the SOC system *(US Department of Labor, 2001)*. We assigned each case to one of the DoL groups. This ensured that the norming samples represented a realistic distribution of jobs from the US workforce. To increase the accuracy of our classifications, two Hogan psychologists completed the groupings independently. This resulted in 99% classification with the remaining discrepancies resolved through discussion. As seen in Table 6.1, the HPI database contains 14 of the 23 DoL occupational categories, or 84.4 % of the 2005 US occupations.

Table 6.1
HPI Database Classified by DoL Occupations

DoL Occupation	Hogan Archive HPI cases	Percent of Total in HPI Archive	Percent of US Employment	Percent of US Occupations Represented
Management occupations	12,097	5.43%	4.6%	4.2%
Business and financial operations occupations	6,567	2.95%	4.2%	3.7%
Architecture and engineering occupations	1,534	.69%	1.8%	4.4%
Healthcare practitioners and technical occupations	3,241	1.46%	5.0%	6.6%
Protective service occupations	205	.09%	2.3%	2.6%
Food preparation and serving related occupations	329	.15%	8.3%	2.2%
Building and grounds cleaning and maintenance occupations	867	.39%	3.3%	1.2%
Personal care and service occupations	939	.42%	2.4%	4.2%
Sales and related occupations	22,678	10.18%	10.7%	2.7%
Office and administrative support occupations	151,791	68.15%	17.5%	6.9%
Construction and extraction occupations	253	.11%	4.9%	7.4%
Installation, maintenance, and repair occupations	9,565	4.29%	4.1%	6.4%
Production occupations	2,891	1.30%	7.9%	13.7%
Transportation and material moving occupations	9,766	4.38%	7.4%	6.2%
TOTAL	222,723	100.00%	84.4%	72.4%

Compared to the US workforce, some occupations were not represented in the HPI archival data and others were over represented. In other words, the current HPI archival data set represents the Hogan client base and there are expected differences between the client base and representation of the total US workforce. To control for this inconsistency, yet maintain the best representation of both the US workforce and the Hogan client base, we calculated the percent of the total US workforce accounted for by the occupations represented in the HPI archival data (i.e., 84.4%). Then, we used this adjustment to determine the number of cases needed from the HPI archival data set by occupation in the norm sample.

The "Office and Administrative Support Occupation" category showed the largest over representation. As such, this category was used as the starting point for developing the normative sample. First, 46,163 respondents were randomly selected from this occupation. Second, this occupation was anchored to equal 30.41% of the normative sample. Third, the sample sizes for other occupational categories were determined based on their percentage within the US workforce and the available sample size within the Hogan archive. Finally, we added cases from occupational categories that did not reach the percentage of people in the US workforce. These steps made the resulting normative sample similar to the US workforce and reduced the norming selection sample from 222,723 to 117,095. The final sample by occupational designation appears in Table 6.2. To reflect the Hogan client base and balance demographic characteristics (e.g, gender), an additional 10,725 selection cases with unknown occupational categories were added to the norming selection sample.

After populating categories to represent the selection client base, development client cases were added. Although development clients are generally in upper-level management jobs and fall into the DoL code of "Management Occupations," they remained separate in the norm group because the examinees' job status may account for some differences in scores and the examinees' motivation for taking the test could also account for score differences.

Table 6.2
HPI Norming Sample Distribution by Occupation Using Applicants in Selection Contexts

Occupation	Number of cases	Percentage
Management occupations	12,097	10.33%
Business and financial operations occupations	6,567	5.61%
Architecture and engineering occupations	1,534	1.31%
Healthcare practitioners and technical occupations	3,241	2.77%
Protective service occupations	205	.18%
Food preparation and serving related occupations	329	.28%
Building and grounds cleaning and maintenance occupations	867	.74%
Personal care and service occupations	939	.80%
Sales and related occupations	22,678	19.37%
Office and administrative support occupations	46,163	30.41%
Construction and extraction occupations	253	.22%
Installation, maintenance, and repair occupations	9,565	8.17%
Production occupations	2,891	2.47%
Transportation and material moving occupations	9,766	8.34%
TOTAL	117,095	100.00%

To ensure that the correct proportion of development cases were included in the norming samples, we searched the Hogan data warehouse for users' HPI data. The ratio of selection to development examinees for the Hogan System is 9:1. To keep this ratio in our norming group, 15,463 development cases were combined with the selection database. The final distribution of selection and development cases is presented in Table 6.3. Adding the development cases to the selection sample described in Table 6.2 resulted in a total norming sample of approximately 10% development cases and 90% selection cases. To enhance the representation of the norming sample, 13,331 unclassified cases were added as shown in Tables 6.3 and 6.4.

Table 6.3
Final Norming Sample Distribution by Test Purpose

Test Purpose	Number of Cases	Percent of Final Sample
Selection	127,820	81.61%
Development	15,463	9.87%
Not indicated	13,331	8.51%
TOTAL	156,614	100.00%

Table 6.4
Final Norm Sample Distribution by Occupation

Occupation	Number of Cases	Percent of Final Sample
Management occupations	12,097	7.72%
Business and financial operations occupations	6,567	4.19%
Architecture and engineering occupations	1,534	0.98%
Healthcare practitioners and technical occupations	3,241	2.07%
Protective service occupations	205	0.13%
Food preparation and serving related occupations	329	0.21%
Building and grounds cleaning and maintenance occupations	867	0.55%
Personal care and service occupations	939	0.60%
Sales and related occupations	22,678	14.48%
Office and administrative support occupations	46,163	29.48%
Construction and extraction occupations	253	0.16%
Installation, maintenance, and repair occupations	9,565	6.11%
Production occupations	2,891	1.85%
Transportation and material moving occupations	9,766	6.24%
No occupation indicated	10,725	6.85%
Development	15,463	9.87%
Not indicated	13,331	8.51%
TOTAL	156,614	100.00%

6.2 Demographics of the Norming Sample

The final norming sample included 156,614 cases representing various occupational groups within the US workforce. Gender and race/ethnicity information within the US workforce also was used to create the final database (see Tables 6.5 and 6.6). Total group norms appear in Appendix C.

Table 6.5
Gender Distribution of Final Norming Sample

Gender	Number of Cases	Percent of Final Sample
Male	60,722	38.77%
Female	60,730	38.78%
Not indicated	35,162	22.45%

Table 6.6
Race/Ethnicity Distribution of Final Norming Sample

Race/Ethnicity	Number of Cases	Percent of Final Sample
Black	13,006	8.30%
Hispanic	15,034	9.60%
Asian American/Pacific Islander	5,067	3.24%
American Indian/Alaskan Native	2,208	1.41%
White	72,975	46.60%
Not indicated	48,324	30.86%

Table 6.7
Norming Sample Ethnic Composition by Age and Gender

Age in Years	Under 40				40 and Over			
Gender	Male		Female		Male		Female	
Ethnicity	%	N	%	N	%	N	%	
Black	5,532	3.53	5,528	3.53	1,009	0.64	510	0.33
Hispanic	6,491	4.14	7,494	4.79	502	0.32	237	0.15
Asian American/PacificIslander	2,462	1.57	2,055	1.31	250	0.16	122	0.08
American Indian/AlaskanNative	984	0.63	981	0.63	144	0.09	68	0.04
White	23,735	15.16	32,900	21.01	8,827	5.64	4,392	2.80
Not indicated	7,308	4.67	4,763	3.04	1,391	0.89	617	0.39
Totals	46,512	29.70	53,721	34.30	12,123	7.74	5,946	3.80

Note. 34,945 individuals aged less than 40 years old did not identify their gender; 158 individuals aged 40 years and over did not identify their gender.

6.3 Descriptive Statistics of the Norming Sample

Tables 6.8 through 6.11 present means and standard deviations for the HPI scales categorized by selected demographics. All statistics are computed from the norming sample.

Table 6.8
Norming Sample Scale Means and Standard Deviations

		Black	Hispanic	Asian/ P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	13,006	15,034	5,067	2,208	72,975	48,324	**156,614**
ADJ	*M*	31.6	31.9	30.5	31.1	31.2	30.8	**31.2**
	SD	4.3	4.0	4.7	4.7	4.7	4.9	**4.7**
AMB	*M*	26.4	26.1	25.5	25.7	25.8	26.0	**25.9**
	SD	2.8	3.0	3.4	3.4	3.5	3.4	**3.4**
SOC	*M*	13.1	14.1	14.9	14.6	14.5	14.0	**14.2**
	SD	4.6	4.4	4.3	4.4	4.7	4.7	**4.7**
INP	*M*	20.4	20.6	20.3	20.5	20.6	20.1	**20.4**
	SD	1.5	1.4	1.7	1.6	1.6	1.9	**1.7**
PRU	*M*	24.2	24.3	23.6	23.8	23.2	22.7	**23.3**
	SD	3.6	3.6	3.8	3.8	3.9	4.0	**3.9**
INQ	*M*	16.1	17.2	17.7	17.9	16.5	16.4	**16.6**
	SD	4.4	4.5	4.3	4.3	4.5	4.5	**4.5**
LRN	*M*	10.7	10.9	10.8	10.9	10.2	9.8	**10.2**
	SD	2.9	2.8	2.8	2.7	3.0	3.1	**3.0**
Validity	*M*	13.7	13.6	13.5	13.6	13.7	13.7	**13.7**
	SD	0.6	0.7	0.8	0.8	0.6	0.7	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.9
Norming Sample Scale Means and Standard Deviations by Age

Age – Under 40 Years		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	11,310	14,056	4,603	1,979	57,214	46,016	**135,178**
ADJ	*M*	31.7	31.9	30.6	31.2	31.4	30.8	**31.3**
	SD	4.2	4.0	4.6	4.6	4.6	4.9	**4.7**
AMB	*M*	26.5	26.1	25.6	25.7	25.9	26.0	**26.0**
	SD	2.7	2.9	3.4	3.3	3.5	3.4	**3.3**
SOC	*M*	13.3	14.1	15.0	14.8	14.8	14.1	**14.3**
	SD	4.6	4.4	4.3	4.3	4.6	4.7	**4.6**
INP	*M*	20.5	20.6	20.3	20.5	20.7	20.2	**20.5**
	SD	1.5	1.4	1.6	1.6	1.5	1.9	**1.6**
PRU	*M*	24.3	24.4	23.6	23.9	23.7	22.7	**23.4**
	SD	3.6	3.6	3.8	3.8	3.9	4.0	**3.9**
INQ	*M*	16.2	17.2	17.8	18.1	16.7	16.5	**16.7**
	SD	4.4	4.4	4.3	4.2	4.5	4.5	**4.5**
LRN	*M*	10.9	11.0	10.9	11.1	10.4	9.8	**10.3**
	SD	2.8	2.7	2.7	2.6	2.9	3.1	**2.9**
Validity	*M*	13.7	13.6	13.5	13.5	13.8	13.7	**13.7**
	SD	0.6	0.7	0.8	0.8	0.5	0.7	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.9 (con't)

Age – 40 Years & Over		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	1,528	740	375	215	13,269	2,100	**18,227**
ADJ	*M*	31.0	30.8	29.4	30.2	30.3	29.7	**30.3**
	SD	4.4	4.6	5.2	5.3	5.3	5.4	**5.2**
AMB	*M*	25.9	25.5	24.8	25.1	25.5	25.3	**25.5**
	SD	2.9	3.2	3.5	4.0	3.7	3.8	**3.6**
SOC	*M*	11.7	12.9	13.1	12.8	13.0	12.5	**12.8**
	SD	4.6	4.6	4.7	4.9	4.9	4.8	**4.8**
INP	*M*	20.2	20.1	19.1	20.2	20.1	19.7	**20.0**
	SD	1.7	1.8	2.7	2.0	2.1	2.2	**2.1**
PRU	*M*	23.8	23.6	22.8	22.9	22.5	22.1	**22.6**
	SD	3.7	3.6	3.7	3.8	4.0	4.1	**4.0**
INQ	*M*	14.9	16.1	16.0	15.6	15.1	15.1	**15.2**
	SD	4.4	4.6	4.5	4.6	4.5	4.4	**4.5**
LRN	*M*	9.5	9.2	9.6	9.0	9.1	9.1	**9.2**
	SD	3.2	3.2	3.1	3.2	3.2	3.3	**3.2**
Validity	*M*	13.6	13.6	13.4	13.8	13.7	13.6	**13.7**
	SD	0.7	0.8	0.9	0.5	0.6	0.7	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.10

Norming Sample Scale Means and Standard Deviations by Gender

MALES		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	6,641	7,156	2,763	1,134	34,230	8,798	**60,722**
ADJ	*M*	31.4	31.9	30.6	31.3	31.2	30.5	**31.2**
	SD	4.2	4.1	4.6	4.6	4.8	5.0	**4.7**
AMB	*M*	26.5	26.5	26.0	26.2	26.3	26.0	**26.3**
	SD	2.7	2.9	3.3	3.2	3.3	3.4	**3.2**
SOC	*M*	13.3	14.8	15.4	15.2	14.9	14.2	**14.6**
	SD	4.7	4.4	4.3	4.5	4.8	4.7	**4.7**
INP	*M*	20.2	20.4	20.1	20.4	20.2	19.8	**20.2**
	SD	1.6	1.5	1.8	1.7	1.8	2.1	**1.8**
PRU	*M*	24.0	23.9	23.3	23.5	22.7	22.2	**22.9**
	SD	3.7	3.8	3.9	0.4	4.0	4.2	**4.0**
INQ	*M*	16.6	18.1	18.4	18.6	17.2	16.8	**17.2**
	SD	4.4	4.3	4.2	4.1	4.4	4.3	**4.4**
LRN	*M*	10.2	10.6	10.7	10.7	9.6	9.5	**9.9**
	SD	3.0	2.9	2.9	2.9	3.1	3.1	**3.1**
Validity	*M*	13.6	13.6	13.4	13.6	13.7	13.6	**13.6**
	SD	0.7	0.7	0.8	0.7	0.6	0.7	**0.7**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.10 (con't)

FEMALES		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	6,104	7,806	2,215	1,056	38,115	5,534	**60,730**
ADJ	*M*	31.8	31.9	30.5	31.0	31.3	29.7	**31.3**
	SD	4.3	4.0	4.7	4.7	4.7	5.5	**4.7**
AMB	*M*	26.3	25.7	25.0	25.2	25.4	25.5	**25.5**
	SD	2.8	3.0	3.5	3.5	3.6	3.7	**3.5**
SOC	*M*	13.0	13.4	14.3	14.1	14.3	14.2	**14.0**
	SD	4.5	4.4	4.3	4.3	4.6	4.7	**4.6**
INP	*M*	20.6	20.7	20.4	20.6	20.9	20.3	**20.8**
	SD	1.4	1.3	1.6	1.5	1.3	1.8	**1.4**
PRU	*M*	24.5	24.7	23.9	24.2	23.7	22.5	**23.8**
	SD	3.5	3.5	3.6	3.6	3.7	3.9	**3.7**
INQ	*M*	15.5	16.3	16.9	17.1	15.8	15.5	**15.9**
	SD	4.3	4.5	4.3	4.4	4.6	4.7	**4.6**
LRN	*M*	11.3	11.2	11.0	11.1	10.7	10.1	**10.8**
	SD	2.6	2.6	2.6	2.6	2.7	2.9	**2.7**
Validity	*M*	13.7	13.6	13.5	13.5	13.8	13.7	**13.7**
	SD	0.6	0.6	0.8	0.8	0.5	0.6	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.11
Norming Sample Scale Means and Standard Deviations by Age and Gender

MALES < 40 years		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	5,532	6,491	2,462	984	23,735	7,308	**46,512**
ADJ	*M*	31.5	31.9	30.7	31.5	31.4	30.6	**31.3**
	SD	4.2	4.0	4.6	4.6	4.7	5.0	**4.6**
AMB	*M*	26.6	26.5	26.0	26.3	26.4	26.1	**26.4**
	SD	2.7	2.9	3.2	3.1	3.2	3.3	**3.1**
SOC	*M*	13.6	14.9	15.6	15.5	15.3	14.4	**14.9**
	SD	4.6	4.3	4.2	4.3	4.6	4.6	**4.6**
INP	*M*	20.3	20.5	20.3	20.4	20.3	19.9	**20.3**
	SD	1.5	1.5	1.6	1.7	1.7	2.0	**1.7**
PRU	*M*	24.0	24.0	23.4	23.6	22.8	22.3	**23.1**
	SD	3.7	3.8	3.9	4.1	4.1	4.2	**4.0**
INQ	*M*	16.8	18.2	18.6	18.9	17.6	17.0	**17.6**
	SD	4.4	4.2	4.1	4.0	4.2	4.3	**4.3**
LRN	*M*	10.4	10.7	10.8	11.0	9.9	9.6	**10.1**
	SD	2.9	2.8	2.8	2.8	3.1	3.0	**3.0**
Validity	*M*	13.6	13.6	13.4	13.6	13.7	13.6	**13.6**
	SD	0.7	0.7	0.8	0.7	0.6	0.7	**0.7**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.11 (con't)

FEMALES < 40 years		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	5,528	7,494	2,055	981	32,900	4,763	**53,721**
ADJ	*M*	31.9	31.9	30.5	31.0	31.5	29.7	**31.4**
	SD	4.2	4.0	4.6	4.6	4.6	5.5	**4.6**
AMB	*M*	26.3	25.7	25.0	25.2	25.5	25.6	**25.6**
	SD	2.8	3.0	3.5	3.4	3.6	3.6	**3.4**
SOC	*M*	13.0	13.4	14.3	14.2	14.4	14.4	**14.1**
	SD	4.5	4.4	4.2	4.3	4.6	4.7	**4.5**
INP	*M*	20.6	20.7	20.5	20.6	21.0	20.3	**20.8**
	SD	1.3	1.3	1.5	1.4	1.2	1.8	**1.3**
PRU	*M*	24.6	24.7	24.0	24.3	23.9	22.5	**23.9**
	SD	3.5	3.5	3.6	3.6	3.6	3.9	**3.7**
INQ	*M*	15.6	16.4	17.0	17.3	16.0	15.6	**16.0**
	SD	4.3	4.4	4.3	4.3	4.6	4.7	**4.5**
LRN	*M*	11.4	11.2	11.1	11.2	10.8	10.2	**10.9**
	SD	2.6	2.6	2.6	2.5	2.7	2.9	**2.7**
Validity	*M*	13.7	13.6	13.5	13.5	13.8	13.7	**13.7**
	SD	0.6	0.6	0.8	0.8	0.5	0.6	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.11 (con't)

MALES ≥ 40 years		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	1,090	502	250	144	8,827	1,391	**12,123**
ADJ	*M*	30.9	30.8	29.4	30.2	30.4	29.8	**30.3**
	SD	4.2	4.6	5.0	4.9	5.2	5.3	**5.1**
AMB	*M*	26.1	25.5	25.1	25.4	25.8	25.4	**25.7**
	SD	2.8	3.3	3.5	3.7	3.5	3.7	**3.5**
SOC	*M*	11.6	13.0	13.5	12.9	13.1	12.5	**12.9**
	SD	4.6	4.6	4.9	5.1	4.9	4.8	**4.8**
INP	*M*	20.0	19.9	18.8	20.0	19.8	19.5	**19.8**
	SD	1.7	1.9	2.9	2.0	2.2	2.3	**2.2**
PRU	*M*	23.8	23.4	22.7	22.7	22.4	22.0	**22.5**
	SD	3.7	3.6	3.7	3.8	4.0	4.2	**4.0**
INQ	*M*	15.2	16.4	16.2	15.9	15.6	15.4	**15.6**
	SD	4.4	4.5	4.4	4.5	4.4	4.3	**4.4**
LRN	*M*	9.2	9.1	9.3	8.8	8.9	8.8	**8.9**
	SD	3.2	3.2	3.2	3.2	3.3	3.4	**3.3**
Validity	*M*	13.6	13.5	13.4	13.8	13.7	13.5	**13.6**
	SD	0.7	0.8	0.9	0.5	0.6	0.8	**0.7**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

Table 6.11 (con't)

FEMALES ≥ 40 years		Black	Hispanic	Asian/P.I.	American Indian/A.N.	White	Not Indicated	Totals
	N	510	237	122	68	4,392	617	**5,946**
ADJ	*M*	31.1	30.8	29.4	30.4	30.1	29.7	**30.1**
	SD	4.8	4.7	5.6	5.6	5.5	5.6	**5.4**
AMB	*M*	25.7	25.5	24.4	24.2	24.8	24.9	**24.9**
	SD	3.0	3.1	3.5	4.4	4.0	3.9	**3.9**
SOC	*M*	11.9	12.7	12.3	12.3	12.8	12.7	**12.7**
	SD	4.6	4.4	4.4	4.4	4.9	5.0	**4.8**
INP	*M*	20.5	20.5	19.7	20.7	20.6	20.2	**20.5**
	SD	1.5	1.5	2.2	1.9	1.7	2.0	**1.7**
PRU	*M*	23.7	24.1	23.1	23.5	22.8	22.3	**22.9**
	SD	3.7	3.5	3.7	3.7	3.8	3.9	**3.8**
INQ	*M*	14.2	15.4	15.7	14.8	14.2	14.5	**14.3**
	SD	4.3	4.6	4.7	4.9	4.6	4.6	**4.6**
LRN	*M*	10.1	9.5	10.3	9.5	9.7	9.6	**9.7**
	SD	3.0	3.2	2.6	3.1	3.0	3.1	**3.0**
Validity	*M*	13.7	13.7	13.4	13.8	13.8	13.7	**13.7**
	SD	0.7	0.7	0.9	0.4	0.5	0.6	**0.6**

Note. P.I. = Pacific Islander, A.N. = Alaskan Native.

6.4 Uses and Applications

There is no indication that selection using the HPI will result in adverse impact against any group for any of the job families examined. Therefore, because the HPI is valid and does not discriminate unfairly, Hogan recommends the **Hogan Job Family Approach** for selection pertaining to each job family. Results should be scored and evaluated using the recommended scales and cutoff scores outlined throughout this report. Employment suitability should be determined, in part, by assessing scores on the recommended HPI scales for each job family.

The justification for the recommended cutoff scores in this report depends on correct classification of the users' jobs into the appropriate job family. Individuals responsible for assigning jobs to job families should be given adequate job information to make accurate classifications. Hogan is not responsible for these classifications. Hogan can advise users about job classification.

The following procedures will help Hogan clients use and monitor the selection process. First, the applicant flow should be examined to determine if the recommended cutoff scores allow enough applicants to pass. Second, employers should maintain records of test scores by demographic group, as indicated in the *Uniform Guidelines*, to evaluate the possibility of adverse impact resulting from the use of the HPI. Third, employers, in conjunction with Hogan personnel, should review the entire selection process to determine if any procedures can be improved. This step should be taken after the selection process has been used for at least six months. Finally, performance appraisal and/or monitoring data should be maintained, if possible, on new people who are hired using this selection procedure. These data will provide a check on the validity of the selection procedure and will help determine utility/return on investment. In addition, Hogan recommends conducting follow-up analyses on the people who were hired using the HPI and exploring the utility and bottom-line impact of the proposed selection system. For further information concerning this research, please contact:

Hogan Assessment Systems
P.O. Box 521176
Tulsa, Oklahoma 74152
918.749.0632

6.5 Accuracy and Completeness

Hogan attests to the accuracy of the data collection, analysis, and reporting procedures used in this validity study. For transportability of validity, Hogan reviewed an archival research database with previously conducted criterion-related validation studies, and attempted to identify jobs with similar technical and personal requirements. Research on the archival job(s) was used to form hypotheses regarding which personality scales would be likely to predict performance. Then, Hogan extracted the validity coefficients

for the archival job(s) from the technical report(s), entered and aggregated the coefficients in a Microsoft Excel spreadsheet, and reported the coefficients in this report.

The process of establishing synthetic validity proceeded from a review of the Hogan competency model for each job family. Hogan searched the Archive for studies including criterion measures that aligned with these competency dimensions. Once identified, Hogan extracted the validity coefficient(s) and sample size(s) from each study and entered those data into an Excel spreadsheet. Hogan then computed the sample-weighted validity coefficients and meta-analyses shown in this report.

Hogan completed all procedures within the requirements of both the *Uniform Guidelines* and the *Principles*. Hogan derived results strictly from data and archived study results and did not embellish, falsify, or alter results in any manner.

7. REFERENCES

Aguinis, H., & Pierce, C. A. (1998). Testing moderator variable hypotheses meta-analytically. *Journal of Management, 24,* 577–592.

Allport, G. W. (1937). *Personality: A psychological interpretation*. New York: Holt.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999). *Standards for educational and psychological testing*. Washington, DC: American Psychological Association.

Arthur, W., Jr., Day, E. A., McNelly, T. L., & Edens, P. S. (2003). A meta-analysis of the criterion-related validity of assessment center dimensions. *Personnel Psychology, 56*, 125-154.

Axford, S. N. (1996). Review of the Hogan Personality Inventory (Revised). In J. C. Impara & J. C. Conoley (Eds.), *The Supplement to the Twelfth Mental Measurements Yearbook*. Lincoln: The University of Nebraska Press.

Balma, M. J. (1959). The development of processes for indirect or synthetic validity. *Personnel Psychology, 12*, 395-396.

Barrett, P. T. (2003). Beyond Psychometrics: measurement, non-quantitative structure, and applied numerics. *Journal of Managerial Psychology, 18*, 421-439.

Barrett, P. T. (2005). Person-target profiling. In A. Beauducel, B. Biehl, M. Bosnjak, W. Conrad, G. Schönberger, and D. Wagener (Eds.), *Multivariate research strategies: A festschrift for Werner Wittman* (pp. 63-118). Aachen: Shaker-Verlag.

Barrick, M. R., & Mount, M. K. (1991). The Big-Five personality dimensions and job performance: A meta-analysis. *Personnel Psychology, 44*, 1-26.

Barrick, M. R., Mount, M. K., & Gupta, R. (2003). Meta-analysis of the relationship between the Five-Factor Model of personality and Holland's occupational types. *Personnel Psychology, 56*, 45-74.

Barrick, M., Mount, M., & Judge, T. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and Assessment, 9*, 9-30.

Bentler, P. M., & Wu, E . J. C. (2006). *EQS 6.1 structural equations program*. Encino, CA: Multivariate Software, Inc.

Bono, J., & Judge, T. (2004). Personality and transformational and transactional leadership: A meta-analysis. *Journal of Applied Psychology, 89*, 901-910.

Borman, W. C., Penner, L. A., Allen, T. D., & Motowidlo, S. J. (2001). Personality predictors of citizenship performance. *International Journal of Selection & Assessment, 9*, 52–69.

Brannick, M. T., & Levine, E. L. (2002). Doing a job analysis study. In M. T. Brannick, and E. L. Levine (Eds.) Job analysis: *Methods, research, and applications for human resource management in the new millennium* (pp. 265-294). Thousand Oaks, CA: Sage.

Costa, P. T., Jr., & McCrae, R. R. (1985). *The NEO Personality Inventory manual*. Odessa, FL: Psychological Assessment Resources.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

Cronbach, L.J. (1984). *Essentials of psychological testing* (4th ed.). New York: Harper & Row, Publishers.

De Raad, B., & Perugini, M. (Eds.). (2002). Big Five assessment. Seattle, WA: Hogrefe & Huber.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology, 41*, 417-440.

Dudek, F. J. (1979). The continuing misinterpretation of the standard error of measurement. *Psychological Bulletin, 86*, 335-337.

Dye, D., & Silver, M. (1999). The origins of O*NET. In N. G. Peterson, M. D. Mumford, W. C. Borman, P. R. Jeanneret, & E. A. Fleishman (Eds.), *An occupation information system for the 21st century: The development of the O*NET* (pp. 9-20). Washington, DC: American Psychological Association.

Emler, N. P. (1990). A social psychology of reputation. *European Review of Social Psychology, 1*, 173-193.

Equal Employment Opportunity Commission (1978). Uniform guidelines on employee selection procedures. *Federal Register, 43*, 38290-38315.

Gatewood, R. D., & Feild, H. S. (1994). *Human resource selection* (3rd ed.). Orlando, FL: Dryden Press.

Gaugler, B. B., Rosenthal, D. B., Thornton, G. C., & Bentson, C. (1987). Meta-analysis of assessment center validity. *Journal of Applied Psychology, 72*, 1-28.

Ghiselli, E. E. (1966). *The validity of occupational aptitude tests*. New York: Wiley.

Ghiselli, E. E., & Brown, C. H. (1955). *Personnel and industrial psychology* (2nd ed.). New York: McGraw-Hill.

Ghiselli, E. E., Campbell, J. P., & Zedeck, S. (1981). *Measurement theory for the behavioral sciences*. San Francisco: W. H. Freeman and Company.

Goffman, E. (1958). *The presentation of self in everyday life*. New York: Doubleday.

Goldberg, L. R. (1990). An alternative "description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology, 59*, 1216-1229.

Goldberg, L. R. (1992). The development of markers for the Big Five factor structure. *Psychological Assessment, 4*, 26-42.

Goldberg, L. R. (2000). [Hogan Personality Inventory and NEO PI-R correlation coefficients]. Unpublished raw data based on the International Personality Item Pool Project.

Gough, H. G. (1975). *Manual for the California Psychological Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Gough, H. G. (1996). *CPI manual*. Palo Alto, CA: Consulting Psychologists Press.

Grice, J. (2001a). A comparison of factor scores under conditions of factor obliquity. *Psychological Methods, 6*, 67-83.

Grice, J. (2001b). Computing and evaluating factor scores. *Psychological Methods, 6*, 430-450.

Grice, J., & Harris, R. (1998). A Comparison of regression and loading weights for the computation of factor scores. *Multivariate Behavioral Research, 33*, 221-247.

Guion, R. M. (1965). Synthetic validity in a small company: A demonstration. *Personnel Psychology, 18,* 40-63.

Guion, R. M. (1998). *Assessment, measurement, and prediction for personnel decisions*. Mahwah, NJ: Lawrence Erlbaum.

Hase, H. D., & Goldberg, L. R. (1967). Comparative validities of different strategies of constructing personality inventory scales. *Psychological Bulletin, 67*, 231-248.

Hathaway, S. R., & McKinley, J. C. (1943). *Manual for the Minnesota Multiphasic Personality Inventory*. New York: Psychological Corporation.

Hoffman, C. C., Holden, L. M, & Gale, E. (2000). So many jobs, so little "n": Applying expanded validation models to support generalization of cognitive ability. *Personnel Psychology, 53,* 955–991.

Hogan, J., Davies, S., & Hogan, R. (2007). Generalizing personality-based validity evidence. In M. S. McPhail (Ed.), *Alternative validation strategies: Developing new and leveraging existing validity evidence* (pp. 181-229). San Francisco, CA: Jossey-Bass.

Hogan, J., & Holland, B. (2003). Using theory to evaluate personality and job-performance relations: A socioanalytic perspective. *Journal of Applied Psychology, 88*, 100-112.

Hogan, J., & Rybicki, S. (1998). *Performance Improvement Characteristics job analysis manual*. Tulsa, OK: Hogan Assessment Systems.

Hogan, R. (1983). A socioanalytic theory of personality. In M. M. Page (Ed.), *1982 Nebraska symposium on motivation* (pp. 55-89). Lincoln: University of Nebraska Press.

Hogan, R. (2005). In defense of personality measurement: New wine for old whiners. *Human Performance, 18*, 331-341.

Hogan, R., & Hogan, J. (1995). *Hogan Personality Inventory manual* (2nd ed.). Tulsa, OK: Hogan Assessment Systems.

Hogan, R., & Hogan, J. (2007). *Hogan Personality Inventory manual* (3rd ed.). Tulsa, OK: Hogan Assessment Systems.

Hogan, R., Hogan, J., & Trickey, J. (1999). Goodbye mumbo jumbo: The transcendental beauty of a validity coefficient. *Selection Development Review, 15*, 3-9.

Hogan, R., Hogan, J., & Warrenfeltz, R. (2007). *Hogan guide*. Tulsa, OK: Hogan Assessment Systems.

Hogan, R., & Warrenfeltz, R. (2003). Educating the modern manager. *Academy of Management Learning and Education, 2*, 74-84.

Hough, L. M. (1992). The "Big-Five" personality variables—construct confusion: Description versus prediction. *Human Performance, 5*, 139-156.

Hunter, J. E., & Schmidt, F. L. (1990). Methods of meta-analysis. Newbury Park, CA: Sage.

Hurtz, G. M., & Donovan, J. J. (2000). Personality and job performance: The big five revisited. *Journal of Applied Psychology, 85*, 869-879.

Jeanneret, P. R., & Strong, M. H. (2003). Linking O*Net job analysis information to job requirement predictors: An O*Net application. *Personnel Psychology, 56*, 465-492.

John, O. P. (1990). The "Big-Five" factor taxonomy: Dimensions of personality in the natural language and in questionnaires. In L. A. Pervin (Ed.), *Handbook of personality theory and research* (pp. 66-100). New York: Guilford.

Johnson, J. W., Carter, G. W., Davison, H. K. & Oliver, D. H. (2001). A synthetic validity approach to testing differential prediction hypotheses. *Journal of Applied Psychology, 86*, 774-780.

Johnson, J. W., Carter, G. W., & Tippins, N.T. (2001, April). A synthetic validity approach to the development of a selection system for multiple job families. In J. Johnson, & G. Carter (Chairs), *Advances in the application of synthetic validity*. Symposium conducted at the 16th Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology, 87*, 765-780.

Judge, T., Colbert, A., Ilies, R. (2004). Intelligence and leadership: A quantitative review and test of theoretical propositions. *Journal of Applied Psychology, 89*, 542-552.

Lawshe, C. H. (1952). What can industrial psychology do for small business? (A symposium) 2. Employee selection. *Personnel Psychology, 5*, 31-34.

Lobello, S. G. (1996). Review of the Hogan Personality Inventory (Revised). In J. C. Impara & J. C. Conoley (Eds.), *The Supplement to the Twelfth Mental Measurements Yearbook*. Lincoln: The University of Nebraska Press.

Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. *Biometrika, 57*, 519-530.

Mardia, K. V. (1974). Applications of some measures of multivariate skewness and kurtosis in testing normality and robustness studies. *Sankhya B, 36*, 115-128.

McCloy, R. A. (1994). Predicting job performance scores without performance data. In B. F. Green, & A. S. Mavor (Eds.), *Modeling cost and performance for military enlistment: Report of a workshop*. Washington, DC: National Academy Press.

McCloy, R. A. (2001, April). Predicting job performance scores in jobs lacking criterion data. In J. Johnson, & G. Carter (Chairs), *Advances in the application of synthetic validity*. Symposium conducted at the 16th Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

McCormick, E. J., DeNisi, A. S., & Shaw, J. B. (1979). Use of the Position Analysis Questionnaire for establishing the job component validity of tests. *Journal of Applied Psychology, 64*, 51-56.

McCrae, R. R., & Costa, P. T., Jr. (1987). Validity of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52*, 81-90.

McDaniel, M. A., Morgeson, F. P., Finnegan, E. B., Campion, M. A., & Braverman, E. P. (2001). Use of situational judgment tests to predict job performance: A clarification of the literature. *Journal of Applied Psychology, 86*, 730-740.

McDaniel, M. A., Whetzel, D. L., Schmidt, F. L., & Maurer, S. D. (1994). The validity of employment interviews: A comprehensive review and meta-analysis. *Journal of Applied Psychology, 79*, 599-616.

Michell, J. (1997). Quantitative science and the definition of measurement in psychology. *British Journal of Psychology, 88*, 355-383.

Morgan, C. D., & Murray, H. A. (1935). A method for investigating fantasies: The Thematic Apperception Test. *Archives of Neurology and Psychiatry, 34*, 289-306.

Mossholder, K. W., & Arvey, R. D. (1984). Synthetic validity: A conceptual and comparative review. *Journal of Applied Psychology, 69*, 322-333.

Mount, M. K., & Barrick, M. R. (1995). The Big-Five personality dimensions: Implications for research and practice in human resource management. *Research in Personnel and Human Resource Management, 13*, 153–200.

Mount, M. K., & Barrick, M. R. (2001). *Personal Characteristics Inventory manual*. Wonderlic, Inc.: Libertyville, IL.

Myers, I. B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (1998). *MBTI manual: A guide to the development and use of the Myers-Briggs Type Indicator®* (3rd ed.). Mountain View, CA: CPP, Inc.

Norman, W. T. (1963). Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings. *Journal of Abnormal and Social Psychology, 66*, 574-583.

Nunnally, J.C. (1967). *Psychometric theory*. New York: McGraw-Hill.

Nunnally, J.C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). New York: McGraw-Hill.

O*NET OnLine. (2005). O*NET OnLine – Browse by Job Family. *O*NET 7.0 Database*. Retrieved September 22, 2005 from http://online. onetcenter. org/ find.

Ones, D. S., Viswesvaran, C., & Schmidt, F. L. (1993). Comprehensive meta-analysis of integrity test validation: Findings and implications for personnel selection and theories of job performance. *Journal of Applied Psychology, 78*, 679-703.

Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology, 57*, 8.1-8.21.

Pearlman, K., Schmidt, F. L, & Hunter, J. E. (1980). Validity generalization results for tests used to predict job proficiency and training success in clerical occupations. *Journal of Applied Psychology, 65*, 373-406.

Peterson, N. G., Wise, L. L., Arabian, J., & Hoffman, R. G. (2001). Synthetic validation and validity generalization: When empirical validation is not possible. In J. P. Campbell & D.J. Knapp (Eds.), *Exploring the limits in personnel selection and classification* (pp. 411-451). Mahwah, NJ: Lawrence Erlbaum Associates.

Primoff, E. S. (1959). Empirical validation of the J-coefficient. *Personnel Psychology, 12*, 413-418.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin, 86*, 638-641.

Rosenthal, R., & DiMatteo, M. R. (2001). Meta analysis: Recent developments in quantitative methods for literature reviews. *Annual Review of Psychology, 52*, 59-82.

Rothstein, H. R. (1990). Interrater reliability of job performance ratings: Growth to asymptote level with increasing opportunity to observe. *Journal of Applied Psychology, 75*, 322–327.

Rothstein, H. R., Schmidt, F. L., Erwin, F. W., Owens, W. A., & Sparks, C. P. (1990). Biographical data in employment selection: Can validities be made generalizable? *Journal of Applied Psychology, 75*, 175-184.

Rotter, J. (1966). Generalized expectancies for internal vs. external control of reinforcement. *Psychological Monographs. 80* (Whole No. 609).

Salgado, J. F. (1997). The five factor model of personality and job performance in the European community. *Journal of Applied Psychology, 82*, 30-43.

Salgado, J. F. (1998). Big Five personality dimensions and job performance in Army and civil occupations: A European perspective. *Human Performance, 11*, 271-288.

Salgado, J. F., & Moscoso, S. (1999, May). *Construct validity of two personality inventories based upon the five-factor model (FFM)*. Paper presented at the Fourteenth Annual Meeting of the Society for Industrial and Organizational Psychology, Atlanta, GA.

Satorra, A., & Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye and C. C. Clogg (Eds.). *Latent variables analysis: Applications for developmental research (pp 399-419)*. London: Sage Publications.

Satorra, A. & Bentler, P. M. (2002). A Scaled difference chi-square test statistic for moment structure analysis. *Psychometrika, 66*, 507-514.

Scherbaum, C. A. (2005). Synthetic validity: Past, present, and future. *Personnel Psychology, 58*, 481-515.

Schmidt, F. L., & Hunter, J. E. (1977). Development of a general solution to the problem of validity generalization. *Journal of Applied Psychology, 62*, 529-540.

Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin, 124*, 262-274.

Schmidt, F. L., & Rothstein, H. R. (1994). Applications of validity generalization methods of meta-analysis to biographical data scores in employees' selection. In G. S. Stokes, M. D. Mumford, & W. A. Owens (Eds.), *The biodata handbook: Theory, research, and applications* (pp. 237-260). Palo Alto, CA: Consulting Psychologists Press.

Shrout, P. E., & Fleiss, J. L. (1979) Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*, 420-428.

Smith, M. L., & Glass, G. V. (1977). Meta-analysis of psychotherapy outcome studies. *American Psychologist, 32*, 752-760.

Society for Industrial and Organizational Psychology (2003). *Principles for the validation and use of personnel selection procedures* (4th ed.). Bowling Green, OH: Author.

Stemler, S. E. (2004). A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. *Practical Assessment, Research & Evaluation,* 9. Retrieved March 18, 2007 from http:// PAREonline.net/getvn.asp?v=9&n=4 .

Tett, R. P., Jackson, D. N., & Rothstein, M. (1991). Personality measures as predictors of job performance: A meta-analytic review. *Personnel Psychology, 44*, 703-742.

Thurstone, L. L. (1934). The vectors of mind. Psychological Review, 41, 1-32.

Tupes, E. C., & Christal, R. E. (1961). *Recurrent personality factors based on trait ratings* (Tech. Rep. No. ASD-TR-61-97). Lackland Air Force Base, TX: Aeronautical Systems Division, Personnel Laboratory.

US Department of Labor (1991). *Dictionary of occupational titles* (4th ed. rev.). Washington, DC: US Government Printing Office.

US Department of Labor (2001). *Standard Occupational Classification*. Retrieved September 22, 2005 from http://stats.bls.gov/soc/ soc_majo.htm.

US Department of Labor, Bureau of Labor Statistics (2006, May 24). *News*. Washington, DC: Author.

Warrenfeltz, R. B. (1995, May). *An executive-level validation of the Borman and Brush taxonomy*. Paper presented at the tenth annual conference of the Society for Industrial and Organizational Psychology, Orlando, FL.

Wiggins, J. S., & Pincus, A. L. (1992). Personality structure and assessment. *Annual Review of Psychology, 43*, 473-504.

Zhao, H. & Seibert, S. (2006). The Big Five personality dimensions and entrepreneurial status: A meta-analytical review. *Journal of Applied Psychology, 91*, 259-271.

Zonderman, A. B. (1980). *Inventory construction by the method of homogenous item composites*. Unpublished manuscript, The Johns Hopkins University, Baltimore, MD.

APPENDIX A. O*NET JOB TITLES CLASSIFIED BY JOB FAMILY

Table A.1 Managers & Executives O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
11-1000.00	Top Executives
11-2000.00	Advertising, Marketing, Promotions, Public Relations, and Sales Managers
11-3000.00	Operations Specialties Managers
11-9000.00	Other Management Occupations
27-1011.00	Art Directors
27-2012.00	Producers and Directors
27-2022.00	Coaches and Scouts
27-2041.01	Music Directors
33-1000.00	First-Line Supervisors/Managers, Protective Service Worker
35-1000.00	Supervisors, Food Preparation and Serving Workers
37-1000.00	Supervisors, Building and Grounds Cleaning and Maintenance Workers
39-1000.00	Supervisors, Personal Care and Service Workers
41-1000.00	Supervisors, Sales Workers
43-1000.00	Supervisors, Office and Administrative Support Workers
45-1000.00	Supervisors, Farming, Fishing, and Forestry Workers
47-1000.00	Supervisors, Construction and Extraction Workers
49-1000.00	Supervisors of Installation, Maintenance, and Repair Workers
51-1000.00	Supervisors, Production Workers
53-1000.00	Supervisors, Transportation and Material Moving Workers
55-1000.00	Military Officer Special and Tactical Operations Leaders/Manager

Table A.2 Professionals O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
13-1000.00	Business Operations Specialists
13-2000.00	Financial Specialists
15-1011.00	Computer and Information Scientists, Research
15-2000.00	Mathematical Science Occupations
17-1010.00	Architects, Except Naval
17-2000.00	Engineers
19-1000.00	Life Scientists
19-2000.00	Physical Scientists
19-3000.00	Social Scientists and Related Workers
19-4061.00	Social Science Research Assistants
21-1000.00	Counselors, Social Workers, and Other Community and Social Service Specialists
21-2000.00	Religious Workers
23-1000.00	Lawyers, Judges, and Related Workers
23-2000.00	Legal Support Workers
25-1000.00	Postsecondary Teachers
25-2000.00	Primary, Secondary, and Special Education School Teachers
25-3000.00	Other Teachers and Instructors
25-4000.00	Librarians, Curators, and Archivists

O*NET SOC Code	Job Title
25-9000.00	Other Education, Training, and Library Occupations
27-1020.00	Designers
27-2000.00	Entertainers and Performers, Sports and Related Workers
27-3000.00	Media and Communication Workers
29-1000.00	Health Diagnosing and Treating Practitioners
29-2050.00	Health Diagnosing and Treating Practitioner Support Technicians
29-2061.00	Licensed Practical and Licensed Vocational Nurses
29-9000.00	Other Healthcare Practitioners and Technical Occupations
31-2011.00	Occupational Therapist Assistants
31-2021.00	Physical Therapist Assistants
31-9011.00	Massage Therapists
31-9092.00	Medical Assistants
39-2010.00	Animal Trainers
39-3012.00	Gaming and Sports Book Writers and Runners
39-3092.00	Costume Attendants
39-4010.00	Embalmers
39-5091.00	Makeup Artists, Theatrical and Performance
39-9030.00	Recreation and Fitness Workers
39-9040.00	Residential Advisors
41-9012.00	Models
43-6012.00	Legal Secretaries
45-2010.00	Agricultural Inspectors
47-4010.00	Construction and Building Inspectors
51-9060.00	Inspectors, Testers, Sorters, Samplers, and Weighers
53-2000.00	Air Transportation Workers
53-6040.00	Traffic Technicians
53-6050.00	Transportation Inspectors

Table A.3 Technicians & Specialists O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
13-1041.05	Pressure Vessel Inspectors
15-1000.00	Computer Specialists
15-2091.00	Mathematical Technicians
17-1020.00	Surveyors, Cartographers and Photogrammetrists
17-3000.00	Drafters, Engineering, and Mapping Technicians
19-4000.00	Life, Physical, and Social Science Technicians
25-4013.00	Museum Technicians and Conservators
25-4031.00	Library Technicians
25-9011.00	Audio-Visual Collections Specialists
27-1000.00	Art and Design Workers
27-4000.00	Media and Communication Equipment Workers
29-2000.00	Health Technologists and Technicians
31-9094.00	Medical Transcriptionists
35-2013.00	Cooks, Private Household
43-9010.00	Computer Operators
43-9030.00	Desktop Publishers
45-2020.00	Animal Breeders
47-2010.00	Boilermakers
47-2020.00	Stonemasons
47-2031.05	Boat Builders and Shipwrights
47-2110.00	Electricians
47-2141.00	Painters, Construction and Maintenance
47-2152.00	Plumbers, Pipefitters, and Steamfitters
47-4020.00	Elevator Installers and Repairers
47-5012.00	Rotary Drill Operators, Oil and Gas
47-5013.00	Service Unit Operators, Oil, Gas, and Mining
49-2000.00	Electrical and Electronic Equipment Mechanics, Installers, and Repairers
49-3000.00	Vehicle and Mobile Equipment Mechanics, Installers, and Repairers
49-9000.00	Other Installation, Maintenance, and Repair Occupations
51-2000.00	Assemblers and Fabricators
51-4012.00	Numerical Tool and Process Control Programmers
51-4060.00	Model Makers and Pattern Makers, Metal and Plastic
51-4110.00	Tool and Die Makers
51-5012.00	Book Binders
51-5021.00	Job Printers
51-5022.00	Prepress Technicians and Workers
51-8010.00	Power Plant Operators, Distributors, and Dispathers
51-9070.00	Jewelers and Precious Stone and Metal Workers
51-9080.00	Dental Laboratory Technicians
51-9131.00	Photographic Process Workers
55-3017.00	Radar and Sonar Technicians
55-3018.00	Special Forces

Table A.4 Operations & Trades O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
27-1012.00	Craft Artists
35-2000.00	Cooks and Food Preparation Workers
35-9021.00	Dishwashers
37-2000.00	Building Cleaning and Pest Control Workers
37-3000.00	Grounds Maintenance Workers
39-2020.00	Nonfarm Animal Caretakers
39-3020.00	Motion Picture Projectionists
43-5040.00	Meter Readers, Utilities
43-5050.00	Postal Service Workers
43-9050.00	Mail Clerks and Mail Machine Operators, Except Postal Service
43-9070.00	Office Machine Operators, Except Computer
45-2000.00	Agricultural Workers
45-3000.00	Fishers and Hunting Workers
45-4000.00	Forest, Conservation, and Logging Workers
47-2000.00	Construction Trades Workers
47-3000.00	Helpers, Construction Trades
47-4000.00	Other Construction and Related Workers
47-5000.00	Extraction Workers
49-2092.00	Electric Motor, Power Tool, and Related Parts
49-3021.00	Automotive Body and Related Repairers
49-3022.00	Automotive Glass Installers and Repairers
49-9011.00	Mechanical Door Repairers
49-9012.03	Meter Mechanics
49-9043.00	Maintenance Workers, Machinery
49-9045.00	Refractory Materials Repairers, Except Brickmasons
49-9090.00	Miscellaneous Installation, Maintenance, and Repair Workers
51-2021.00	Coil Winders, Tapers, and Finishers
51-2090.00	Miscellaneous Assemblers and Fabricators
51-3000.00	Food Processing Workers
51-4000.00	Metal Workers and Plastic Workers
51-5000.00	Printing Workers
51-6000.00	Textile, Apparel, and Furnishings Workers
51-7000.00	Woodworkers
51-8000.00	Plant and System Operators
51-9000.00	Other Production Occupations
53-2022.00	Airfield Operations Specialists
53-3000.00	Motor Vehicle Operators
53-4000.00	Rail Transportation Workers
53-5000.00	Water Transportation Workers
53-6010.00	Bridge and Lock Tenders
53-6020.00	Parking Lot Attendants
53-7000.00	Material Moving Workers
55-3000.00	Military Enlisted Tactical Operations and Air/Weapons Specialists

Table A.5 Sales & Customer Support O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
15-1041.00	Computer Support Specialists
41-2000.00	Retail Sales Workers
41-3000.00	Sales Representatives, Services
41-4000.00	Sales Representatives, Wholesale and Manufacturing
41-9000.00	Other Sales and Related Workers
43-4050.00	Customer Service Representatives

Table A.6 Administrative & Clerical O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
29-2071.00	Medical Records and Health Information Technicians
31-1000.00	Nursing, Psychiatric, and Home Health Aides
31-2012.00	Occupational Therapist Aides
31-2022.00	Physical Therapist Aides
31-9000.00	Other Healthcare Support Occupations
43-3000.00	Financial Clerks
43-4000.00	Information and Record Clerks
43-5000.00	Material Recording, Scheduling, Dispatching, and Distributing Workers
43-6000.00	Secretaries and Administrative Assistants
43-9000.00	Other Office and Administrative Support Workers

Table A.7 Service & Support O*NET SOC Codes and Job Titles

O*NET SOC Code	Job Title
31-1011.00	Home Health Aides
33-2000.00	Fire Fighting and Prevention Workers
33-3000.00	Law Enforcement Workers
33-9000.00	Other Protective Service Workers
35-2020.00	Food Preparation Workers
35-3000.00	Food and Beverage Serving Workers
35-9000.00	Other Food Preparation and Serving Related Workers
39-3000.00	Entertainment Attendants and Related Workers
39-4020.00	Funeral Attendants
39-5000.00	Personal Appearance Workers
39-6000.00	Transportation, Tourism, and Lodging Attendants
39-9000.00	Other Personal Care and Service Workers
41-2010.00	Cashiers
41-2021.00	Counter and Rental Clerks
43-2000.00	Communications Equipment Operators
43-3040.00	Gaming Cage Workers
43-3070.00	Tellers
43-4060.00	Eligibility Interviewers, Government Programs
43-4080.00	Hotel, Motel, and Resort Desk Clerks

O*NET SOC Code	Job Title
43-4110.00	Interviewers, Except Eligibility and Loan
43-4130.00	Loan Interviewers and Clerks
43-4140.00	New Accounts Clerks
43-4170.00	Receptionists and Information Clerks
43-4180.00	Reservation and Transportation Ticket Agents and Travel Clerks
43-4190.00	Information and Record Clerks, All Other
43-5030.00	Dispatchers
53-6030.00	Service Station Attendants

APPENDIX B: RECOMMENDED PROCESS STEPS FOR JOB FAMILY CLASSIFICATION AND IMPLEMENTATION

1. Review this report for a complete understanding of Hogan's rationale and approach for providing job family related reports.

2. Review the job description, job posting, and/or job analysis for the job under consideration.

3. Review the job family descriptions provided in Section 1.4 and Chapter 5 and the list of exemplar jobs in Appendix A to determine the most appropriate job family.

4. If multiple SMEs are used, a consensus should be reached. If it is not reached, please contact your Hogan consultant who can engage in an internal review (at additional costs) to identify the best fit.

5. Once job family classification is complete, please present your Hogan consultant with the conclusions you have reached.

6. Your Hogan consultant will ask the Customer Service Team (CST) to create an account for your organization with access to the appropriate Express Report.

7. Your Hogan consultant or a member of the CST will contact you and explain the process for using the Express Report through Hogan's Web-based Assessment Management (WAM) system.

APPENDIX C: DISTRIBUTION OF SCALES FOR THE 2005 HPI NORMATIVE SAMPLE (*N* = 156, 614)

Scores	HPI Scales						
	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Raw	Norms	Norms	Norms	Norms	Norms	Norms	Norms
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1
2	0	0	1	0	0	0	1
3	0	0	1	0	0	0	3
4	0	0	2	0	0	1	5
5	0	0	4	0	0	1	8
6	0	0	6	0	0	2	13
7	0	0	9	0	0	3	19
8	0	0	13	0	0	5	26
9	0	0	17	0	0	7	36
10	0	0	22	0	0	11	47
11	0	0	28	0	0	15	60
12	0	0	34	0	1	19	73
13	0	1	42	1	1	25	86
14	1	1	49	1	2	31	100
15	1	1	58	2	4	39	
16	1	2	66	3	5	47	
17	2	3	73	6	8	55	
18	2	4	80	10	12	63	
19	3	6	86	20	17	71	
20	4	8	91	40	23	79	
21	5	11	95	73	30	86	
22	6	14	98	100	39	91	
23	8	19	100		49	96	
24	10	25	100		59	98	
25	12	33			69	100	
26	15	44			78		
27	19	57			86		
28	23	76			93		
29	28	100			97		
30	35				99		
31	43				100		
32	51						
33	62						
34	73						
35	85						
36	95						
37	100						

Note. ADJ = Adjustment, AMB = Ambition, SOC = Sociability, INP = Interpersonal Sensitivity, PRU = Prudence, INQ = Inquisitive, LRN = Learning Approach.

APPENDIX D: REFERENCES FOR TRANSPORTABILITY OF VALIDITY WITHIN JOB FAMILIES

Tech Rep. Number	Citation
349	Leckband, M. M. (2005). *Development of a personality profile of firefighters* (Tech Rep. No 349). Unpublished doctoral dissertation. Miami, FL: Florida International University.
330	Burnett, D., Facteau, J., Hogan, J., & Holland, B. (2004). *Validity of the Hogan Personality Inventory, Hogan Development Survey, and Bennett Mechanical Comprehension Test for entry-level factory workers* (Tech. Rep. No. 330). Tulsa, OK: Hogan Assessment Systems.
326	Lock, J., Jerden, E., & Bourdeau, N. (2004). *Validity of the Hogan Personality Inventory and FS Situational Judgment Inventory for selecting financial specialist employees: Documentation of evidence for validity generalization, transportability and synthetic validity, and criterion-related validity* (Tech. Rep. No. 326). Tulsa, OK: Hogan Assessment Systems.
325	Moros, A. (2004). *Validity of the Hogan Personality Inventory and Motives, Values, Preferences Inventory for selecting sales representatives* (Tech. Rep. No. 325). Tulsa, OK: Hogan Assessment Systems.
324	Moros, A. (2003). *Validity of the Hogan Personality Inventory, the Hogan Development Survey, and the UPS Multi-Rater Tool for selecting management-level employees: Documentation of evidence for criterion-related validity* (Tech. Rep. No. 324). Tulsa, OK: Hogan Assessment Systems.
323	Moros, A. (2003). *Validity of the Hogan Personality Inventory for selecting truck drivers: Documentation of evidence for job analysis, validity generalization, transportability and synthetic validity, and criterion-related validity* (Tech. Rep. No. 323). Tulsa, OK: Hogan Assessment Systems.
320	Burnett, D. (2004). *Validity of the Hogan Personality Inventory and the Motives, Values, Preferences Inventory for selecting assistant project managers: Documentation of evidence for job analysis, validity generalization, transportability and synthetic validity, and criterion-related validity (*Tech. Rep. No. 320). Tulsa, OK: Hogan Assessment Systems.
319	Shin, H., & Holland, B. (2003). V*alidity of the Hogan Personality Inventory and the Motives, Values, Preferences Inventory for selecting managers and sales representatives: Documentation of evidence for validity generalization and criterion-related validity* (Tech. Rep. No. 319). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
311	Fleming, B. (2003). *Validity of the Hogan Personality Inventory for selecting truck drivers: Documentation of evidence for validity generalization, synthetic validity, and criterion-related validity* (Tech. Rep. No. 311). Tulsa, OK: Hogan Assessment Systems.
310	Moros, A. (2003). *Validity of the Hogan Personality Inventory and the Hogan Development Survey for selecting account managers: Documentation of evidence for job analysis, validity generalization, transportability and synthetic validity, and criterion-related validity*. (Tech. Rep. No. 310). Tulsa, OK: Hogan Assessment Systems.
309	Van Landuyt, C. (2003). *Validity of the Hogan Personality Inventory for selecting management-level employees: Documentation of evidence for validity generalization, transportability, synthetic validity, and criterion-related validity*. (Tech. Rep. No. 309). Tulsa, OK: Hogan Assessment Systems.
304	Van Landuyt, C., & Holland, B. (2002). *Validity of the Hogan Personality Inventory for selecting entry-level employees for supermarkets: Documentation of evidence for validity generalization, synthetic validity, and criterion-related validity* (Tech. Rep. No. 304). Tulsa, OK: Hogan Assessment Systems.
301	Fleming, B., & Holland, B. (2003). *Validity of the Hogan Personality Inventory for selecting loan officers and branch managers: Documentation of evidence for validity generalization, transport, synthetic, and criterion-related validity* (Tech. Rep. No. 301). Tulsa, OK: Hogan Assessment Systems.
297	Fleming, B., & Holland, B. (2002). *Validity of the Hogan Personality Short Form for selecting NBA sales, consumer sales, and care employees: Generalizability, transportability, synthetic, and criterion validation evidence (*Tech. Rep. No. 297). Tulsa, OK: Hogan Assessment Systems.
291	Van Landuyt, C., & Holland, B. (2002). *The Validity of the Hogan Personality Inventory for selecting dispatchers and supervisors: Documentation of evidence for validity generalization, transportability, synthetic validity, and criterion-related validity* (Tech. Rep. No. 291). Tulsa, OK: Hogan Assessment Systems.
288	Van Landuyt, C., Fleming, B., & Holland, B. (2002). V*alidity of the Hogan Personality Inventory in selecting field service technicians and delivery service representatives* (Tech. Rep. No. 288). Tulsa, OK: Hogan Assessment Systems.
287	Marrs, L., Borich, J., & Holland, B. (2002). *The Validity of the Hogan Personality Inventory for selecting cashiers/customer service representatives:Documentation of evidence for validity generalization, transportability, synthetic validity, and criterion-related validity* (Tech. Rep. No. 287). Tulsa, OK: Hogan Assessment Systems.
284	Lock, J. (2000). *Validity of the Hogan Personality Inventory for selecting correctional officers* (Tech. Rep. No. 284). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
280	Fleming, B., Marrs, L., & Holland, B. (2002). *Validity of the Hogan Personality Inventory for selecting regional drivers: Generalizability, transportability, synthetic validation, and criterion evidence* (Tech. Rep. No. 280). Tulsa, OK: Hogan Assessment Systems.
278	Marrs, L., Van Landuyt, C., & Holland, B. (2002). *Validity of the Hogan Personality Inventory for selecting crew members and restaurant managers: Documentation of evidence for validity generalization, transportability, and synthetic validity and criterion-related validity* (Tech. Rep. No. 278). Tulsa, OK: Hogan Assessment Systems.
276	Marrs, L., & Holland, B. (2002). *Preliminary HPI, HDS, and MVPI validity study for customer operators* (Tech. Rep. No. 276). Tulsa, OK: Hogan Assessment Systems.
275	Marrs, L., & Holland, B. (2002). *Preliminary HPI validity study for auto maker employees* (Tech. Rep. No. 275). Tulsa, OK: Hogan Assessment Systems.
274	Marrs, L. (2002). *Preliminary HPI validity study for executive directors* (Tech. Rep. No. 274). Tulsa, OK: Hogan Assessment Systems.
270	Hogan, R., & Michel, R. (1996). *Preemployment testing for owner operators* (Tech. Rep. No. 270). Tulsa, OK: Hogan Assessment Systems.
267	Oh, K., & Holland, B. (2002). *Validity of the Hogan Personality Inventory for selecting police officers* (Tech. Rep. No. 267). Tulsa, OK: Hogan Assessment Systems.
265	Shin, H., & Holland, B. (2001). *Validity of the Hogan Personality Inventory for selecting farm marketing representatives* (Tech. Rep. No. 265). Tulsa, OK: Hogan Assessment Systems.
263	Hogan, J. & Brinkmeyer, K. (1994). *Validity of the Hogan Personality Inventory for selecting telephone sales representatives* (Tech. Rep. No. 263). Tulsa, OK: Hogan Assessment Systems.
256	Shin, H., Van Landuyt, C., & Holland, B. (2001). *Validity of the Hogan Personality Inventory for selecting telephone sales representatives and telemarketing supervisors* (Tech. Rep. No. 256). Tulsa, OK: Hogan Assessment Systems.
247	Van Landuyt, C., Philp, T., & Holland, B. (2001). *Validity of the Hogan Personality Inventory for selecting field service technicians and delivery service representatives* (Tech. Rep. No. 247). Tulsa, OK: Hogan Assessment Systems.
244	Abalos, A., & Shin, H. (2001). *Validity of the Hogan Personality Inventory for selecting surfacing and coating employees* (Tech. Rep. No. 244). Tulsa, OK: Hogan Assessment Systems.
242	Hogan, R., & Holland, B. (1999). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 242). Tulsa, OK: Hogan Assessment Systems
241	Van Landuyt, C., & Holland, B. (2001). *Validity of the Hogan Personality Inventory for selecting mechanics* (Tech. Rep. No. 241). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
221	McDonald, D. G., Beckett, M. B., & Hodgdon, J. A. (1988). *Psychological predictors of fitness and performance in active duty* (Tech. Rep. No. 221). San Diego, California: Naval Health Research Center.
220	Shanks, D. (2000). *Can personality be used to identify officer potential in the fire brigade?* (Tech. Rep. No. 220). Unpublished master's thesis, University of Aberdeen, London UK.
219	McDaniel, S. (2000). [Validity of the Hogan Personality Inventory for field sales, salaried professional, and managerial jobs] (Tech. Rep. No. 219). Unpublished raw data. Tulsa, OK: Hogan Assessment Systems.
216	Shin, H. C., Holland, B., & Hogan, R. (2000). *Validity of the Hogan Personality Inventory for selecting sales people* (Tech. Rep. No. 216). Tulsa, OK: Hogan Assessments Systems.
214	Barnett, G., Shin, H. C., & Holland, B. (2000). *Validity of the Hogan Personality Inventory for selecting crewmen* (Tech. Rep. No. 214). Tulsa, OK: Hogan Assessment Systems.
213	Barnett, G., & Lock, J. (2000). *Validity of the Hogan Personality Inventory for selecting bank tellers* (Tech. Rep. No. 213). Tulsa, OK: Hogan Assessment Systems.
209	Hogan, R., & Holland B. (1998). V*alidity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 209). Tulsa, OK: Hogan Assessment Systems.
203	Abalos, A., McDaniel, S., & Kisner, R. F. (2000). *Validity of the Hogan Personality Inventory for selecting bus operators* (Tech. Rep. No. 203). Tulsa, OK: Hogan Assessment Systems.
200	Shelton, D., Holland, B., & Hogan, J. (1999). *Selecting terminal managers using the Hogan Personality Inventory, the Hogan Development Survey, and the Motives, Values, Preferences Inventory* (Tech. Rep. No. 200). Tulsa, OK: Hogan Assessment Systems.
199	Lock, J. (1997). *Development and validation of selection procedures for the information technology department* (Tech. Rep. No. 199). Houston, TX: Jeanneret & Associates, Inc.
196	Brinkmeyer, K. R. (1999). *Sales representative profiling and validity study using the Hogan Personality Inventory, the Hogan Development Survey, and the Motives, Values, Preferences Inventory* (Tech. Rep. No. 196). Tulsa, OK: CDR Assessment Group.
194	Ryan, A. M., & Ployhart, R. E. (1995). *A criterion-related validation study of the Hogan Personality Inventory for police officers* (Tech. Rep. No. 194). Perrysburg, OH: AMR, Inc.

Tech Rep. Number	Citation
193	Connolly, P. M. (1996). [Relations between Overseas Assignment Inventory ratings and Hogan Personality Inventory scores] (Tech. Rep. No. 193). Unpublished raw data. Old Saybrook, CT: Performance Programs.
192	Shelton, D., Holland, B., & Hogan, J. (2000). *Validity of the Hogan Personality Inventory for selecting managers* (Tech. Rep. No. 192). Tulsa, OK: Hogan Assessment Systems.
190	Shin, H. C., Holland, B., & Hogan, R. (2000). *Validity of Hogan Personality Inventory for selecting customer service operators* (Tech. Rep. No. 190). Tulsa, OK: Hogan Assessment Systems.
185	Hogan, J., Hogan, R., & Klippel, D. (2000). *Validity of the Hogan Personality Inventory for selecting locomotive engineer trainees* (Tech. Rep. No. 185). Tulsa, OK: Hogan Assessment Systems.
182	Holland, B., Shin, H., & Hogan, J. (2000). *Selecting Project Managers, Superintendents, and Estimators using the Hogan Personality Inventory, Hogan Development Survey, and Motives, Values, Preferences Inventory* (Tech. Rep. No. 182). Tulsa, OK: Hogan Assessment Systems.
181	Personnel Assessment, Inc. (1999). V*alidity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 181). Tulsa, OK: Hogan Assessment Systems.
179	Holland, B., & Hogan, J. (1999). *Validity of Hogan Personality Inventory for selecting outside sales associates* (Tech. Rep. No. 179). Tulsa, OK: Hogan Assessment Systems.
175	Ross, R., & Hogan, J. (1999). *Validity of the Hogan Personality Inventory for selecting store managers* (Tech. Rep. No. 175). Tulsa, OK: Hogan Assessment Systems.
174	Kisner, R. F., Holland, B., & Hogan, J. (1999). *Validity of the Hogan Personality Inventory for trading assistants* (Tech. Rep. No. 174). Tulsa, OK: Hogan Assessment Systems.
173	Kisner, R. F., & McDaniel, S. (1999). *Validity of the Hogan Personality Inventory for selecting termite inspectors* (Tech. Rep. No. 173). Tulsa, OK: Hogan Assessment Systems.
172	Hogan, R., & Holland, B. (1998). *Validity of the Hogan Personality Inventory for selecting auditors* (Tech. Rep. No. 172). Tulsa, OK: Hogan Assessment Systems.
171	Rybicki, S. (2000). [Validity of the Hogan Personality Inventory for customer service representatives] (Tech. Rep. No. 171). Unpublished raw data. Tulsa, OK: Hogan Assessment Systems.
170	Hogan, J., Holland, B., & Hogan, R. (1998). *Validity of the Hogan Personality Inventory for selecting emergency communications officers* (Tech. Rep. No. 170). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
169	Hogan, J., Holland, B., & Hogan, R. (1998). *Validity of the Hogan Personality Inventory for selecting mechanics* (Tech. Rep. No. 169). Tulsa, OK: Hogan Assessment Systems.
168	Holland, B., & Hogan, J. (1999). *Validity of the Hogan Personality Inventory for selecting recreation leaders* (Tech. Rep. No. 168). Tulsa, OK: Hogan Assessment Systems.
167	Holland, B., & Hogan, J. (1999). *Validity of the Hogan Personality Inventory for selecting clerical support aides II and III* (Tech. Rep. No. 167). Tulsa, OK: Hogan Assessment Systems.
166	McDaniel, S. (1999). *Validity of the Hogan Personality Inventory for selecting sheriff's deputies* (Tech. Rep. No. 166). Tulsa, OK: Hogan Assessment Systems.
165	Brinkmeyer, K., & Hogan, R. (1996). *Preemployment screening for customer service representatives* (Tech. Rep. No. 165). Tulsa, OK: Hogan Assessment Systems.
164	Brinkmeyer, K. R. (1999). *Customer service employee profiling & validity study using the Hogan Personality Inventory, the Hogan Development Survey, & the Motives, Values, Preferences Inventory* (Tech. Rep. No. 164). Tulsa, OK: CDR Assessment Group.
162	Holland, B., Kisner, R. F., & McDaniel, S. (1999). *Predicting turnover using the Hogan Personality Inventory for customer service representatives, driver/delivery and installation personnel, and service personnel* (Tech. RepNo. 162). Tulsa, OK: Hogan Assessments System.
158	Hogan, J., Najar, M., & Holland, B. (1999). *Validity of the Hogan Personality Inventory of selecting managers* (Tech. Rep. No. 158). Tulsa, OK: Hogan Assessment Systems.
157	Gregg, M., & Rudolph, L. (1998). *Using personality assessment as the basis for selecting business managers* (Tech. Rep. No. 157). Southampton, Hampshire: Ramsey Hall/Lloyds UDT.
155	McDaniel, S. & Hogan, J. (1998). *Using the Hogan Personality Inventory to select jeffboat supervisors* (Tech. Rep. No. 155). Tulsa, OK: Hogan Assessment Systems.
152	Rybicki, S., & Hogan, R. (1997). *Personality profiles of a sales group* (Tech. Rep. No. 152). Tulsa, OK: Hogan Assessment Systems.
151	McDaniel, S. (1998). *Validity of Hogan Personality Inventory for selecting supervisors* (Tech. Rep. No. 151). Tulsa, OK: Hogan Assessment Systems.
149	Brinkmeyer, K., & Hogan, R. (1998). *Validity of the Hogan Personality Inventory for selecting customer service representatives* (Tech. Rep. No. 149). Tulsa, OK: Hogan Assessment Systems.
148	Hogan, R., & Powell, J. (1998). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 148). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
142	Ross, R., Rybicki, S., & Hogan, J. (1997). *Validity of the Hogan Personality Inventory for selecting office clerks and office managers* (Tech. Rep. No. 142). Tulsa, OK: Hogan Assessment Systems.
140	Hogan, R., & Heidelberg, H. (1998). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 140). Tulsa, OK: Hogan Assessment Systems.
138	Lock, J. (1995). *Using Hogan Personality Inventory for Selecting Customer & Policy Service Representatives, Data Entry Operators, and Document Processors* (Tech. Rep. No. 138). Tulsa, OK: Hogan Assessment Systems.
137	Hogan, J., Michel, R. & Hogan, R. (1997). *Validity of personality measures for entry level jobs: Final report* (Tech. Rep. No. 137). Tulsa, OK: Hogan Assessment Systems.
136	Brinkmeyer, K., Hogan, R., & Heidelberg, H. (1997). V*alidity of the Hogan Personality Inventory for selecting pipe manufacturing workers* (Tech. Rep. No. 136). Tulsa, OK: Hogan Assessment Systems.
135	Brinkmeyer, K., & Hogan, R. (1997). *Validity of the Hogan Personality Inventory for selecting telemarketers* (Tech. Rep. No. 135). Tulsa, OK: Hogan Assessment Systems.
134	Hogan, R., & Brinkmeyer, K. (1996). *Preemployment screening for drivers* (Tech. Rep. No. 134). Tulsa, OK: Hogan Assessment Systems.
131	Brinkmeyer, K., & Hogan, R. (1996). *Preemployment screening for customer service representatives* (Tech. Rep. No. 131). Tulsa, OK: Hogan Assessment Systems.
130	Hogan, R., & Heidelberg, H. (1998). *Validity of the Hogan Personality Inventory for selecting dockworkers* (Tech. Rep. No. 130). Tulsa, OK: Hogan Assessment Systems.
129	Hogan, R., & Heidelberg, H. (1998). V*alidity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 129). Tulsa, OK: Hogan Assessment Systems.
127	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting certified nursing assistants* (Tech. Rep. No. 127). Tulsa, OK: Hogan Assessment Systems.
126	Hogan, J., Rybicki, S., Heidelberg, H., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting offshore anchor handlers* (Tech. Rep. No. 126). Tulsa, OK: Hogan Assessment Systems.
125	Hogan, J., Rybicki, S., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting international relocation consultants and international relocation assistants* (Tech. Rep. No. 125). Tulsa, OK: Hogan Assessment Systems.
124	Hogan, R., & Shelton, D. (1997). *Preemployment screening for road drivers, city drivers, mechanics, and jockeys* (Tech. Rep. No. 124). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
123	Shelton, D. (1997). Validation study using the Hogan Personality Inventory for service operations coordinators (Tech. Rep. No. 123). Tulsa, OK: Hogan Assessment Systems.
122	Sinangil, H. K., Ones, D. S., & Cemalcilar, Z. (1997, July). *Personality characteristics of expatriate managers working in Turkey (Tech. Rep. No. 122). Paper presented at the 5th European Congress of Psychology, Dublin, Ireland*.
121	Rybicki, S., & Hogan, R. (1996). *Validity of the Hogan Personality Inventory for selecting sales/service technicians* (Tech. Rep. No. 121). Tulsa, OKHogan Assessment Systems.
120	Rybicki, S., & Hogan, J. (1997). *Validity of the Hogan Personality Inventory Form-S for selecting correctional deputy sheriffs* (Tech. Rep. No. 120). Tulsa, OK: Hogan Assessment Systems.
119	Hogan, J., & Rybicki, S. (1997). *Validity of correctional officer selection procedures* (Tech. Rep. No. 119). Tulsa, OK: Hogan Assessment Systems.
118	Rybicki, S., & Hogan, R. (1997). *Validity of the Hogan Personality Inventory for selecting facility administrators* (Tech. Rep. No. 118). Tulsa, OK: Hogan Assessment Systems.
117	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting mechanics* (Tech. Rep. No. 117). Tulsa, OK: Hogan Assessment Systems.
116	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting truck drivers* (Tech. Rep. No. 116). Tulsa, OK: Hogan Assessment Systems.
115	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting conservation officers* (Tech. Rep. No. 115). Tulsa, OK: Hogan Assessment Systems.
114	Hogan, R., & Shelton, D. (1997). *Preemployment screening for quality management, administrative, and clerical personnel* (Tech. Rep. No. 114). Tulsa, OK: Hogan Assessment Systems.
112	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting freight handlers* (Tech. Rep. No. 112). Tulsa, OK: Hogan Assessment Systems.
111	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 111). Tulsa, OK: Hogan Assessment Systems.
110	Hogan, R., & Shelton, D. (1997). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 110). Tulsa, OK: Hogan Assessment Systems.
109	Rioux, S. (1997). *Validation study of personality with customer service representatives* (Tech. Rep. No. 109). Talahassee, FL: Florida Power Corporation.

Tech Rep. Number	Citation
107	Brinkmeyer, K. R., & Hogan, R. (1997). Validity of the Hogan Personality Inventory for selecting field representatives (Tech. Rep. No. 107). Tulsa, OK: Hogan Assessment Systems.
106	Brinkmeyer, K., & Hogan R. (1996). *Validity of the Hogan Personality Inventory for the selection of reservation sales representatives* (Tech. Rep. No. 106). Tulsa, OK: Hogan Assessment Systems.
104	Stovall, D., & Hogan, R. (1997). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 104). Tulsa, OK: Hogan Assessment Systems.
103	Stovall, D., Rybicki, S., Hogan, R., & Hauxwell, R. (1997). *Preemployment screening for cashiers* (Tech. Rep. No. 103). Tulsa, OK: Hogan Assessment Systems.
102	Rybicki, S., Brinkmeyer, K., & Hogan, R. (1997). *Validity of the Hogan Personality Inventory for selecting customer service representatives, drivers, and delivery and installation/service employees* (Tech. Rep. No. 102). Tulsa, OKHogan Assessment Systems.
101	Rybicki, S., & Hogan, J. (1996). *Validity of the Hogan Personality Inventory and the Motives, Values, Preferences Inventory for selecting small business bankers* (Tech. Rep. No. 101). Tulsa, OK: Hogan Assessment Systems.
99	Rybicki, S. & Hogan, R. (1996). *Validity of the Hogan Personality Inventory for selecting of sales* (Tech. Rep. No. 99). Tulsa, OK: Hogan Assessment Systems.
96	Hogan, R., & Brinkmeyer, K. (1996). *Preemployment screening for drivers* (Tech. Rep. No. 96). Tulsa, OK: Hogan Assessment Systems.
95	Rybicki, S., & Hogan, R. (1996). *Validity of the Hogan Personality Inventory for selecting sales/service technicians*. (Tech. Rep. No. 95). Tulsa, OK: HogaAssessment Systems.
94	Brinkmeyer, K. (1996). *Validation study for drivers* (Tech. Rep. No. 94). Tulsa, OK: Hogan Assessment Systems.
92	McDaniel, S., & Hogan, R. (1997). [Correlation coefficients between HPI and performance scores of flight attendants] (Tech. Rep. No. 92). Unpublished raw data. Tulsa, OK: Hogan Assessment Systems.
91	Hogan, J., Rybicki, S., & Hogan, R. (1996). *Validity of the Hogan Personality Inventory for selecting drivers and customer service representatives* (Tech. Rep. No. 91). Tulsa, OK: Hogan Assessment Systems.
90	Hogan, R., & Brinkmeyer, K. (1996). *Preemployment screening for drivers* (Tech. Rep. No. 90). Tulsa, OK: Hogan Assessment Systems.
88	Hogan, R., & Brinkmeyer, K. (1996). *Preemployment screening for telemarketers* (Tech. Rep. No. 88). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
87	Borman, W. C., Logan, K. K., Hedge, J. W., Hanson, M. A., Bruskiewicz, K. T., Schneider, R. J., & Houston, J. S. (1996). *Basic research evaluating reliability of the situational test of aircrew response styles and its ability, personality, and leadership correlates.* (Tech. Rep. No. 87). Tampa, FL: Personnel Decisions Research Institutes.
86	Hogan, J., & Stovall, D. (1996). *Validity of the Hogan Personality Inventory for selecting customer operations representatives* (Tech. Rep. No. 86). Tulsa, OK: Hogan Assessment Systems.
85	Hogan, J., & Michel, R. (1996). *Validity of the Hogan Personality Inventory for the selection of cashiers* (Tech. Rep. No. 85). Tulsa, OK: Hogan Assessment Systems.
84	Hogan, R., Hogan, J., & Stovall, D. (1996). *Validity of the Hogan Personality Inventory for selecting trading assistants* (Tech. Rep. No. 84). Tulsa, OK: Hogan Assessment Systems.
83	Hogan, R., Hogan, J., Stovall, D., & Brinkmeyer, K. (1995). *Validity of the Hogan Personality Inventory for employee selection* (Tech. Rep. No. 83). Tulsa, OK: Hogan Assessment Systems.
81	Landy, F. (1995). *Validity study results for using the Hogan Personality Inventory to select police officers* (Tech. Rep. No. 81). Spring, CO: Landy, Jacobs and Associates.
80	Hogan, R., Hogan, J., & Stovall, D. (1995). *Validity of the Hogan Personality Inventory for selecting bank tellers* (Tech. Rep. No. 80). Tulsa, OK: Hogan Assessment Systems.
79	Hayes, T. L., Roehm, H. A., & Castellano, J. P. (1994). *Personality correlates of success in total quality manufacturing* (Tech. Rep. No. 79). Journal of Business and Psychology, 8, 397-411.
78	Muchinsky, P. M. (1993). *Validation of personality constructs for the selection of insurance industry employees* (Tech. Rep. No. 78). Journal of Business and Psychology, 7, 475-482.
77	Hogan, J., Hogan, R., & Rybicki, S. (1995). *Validity of the Hogan Personality Inventory and the Inventory of Personal Motives for selecting marketing personnel* (Tech. Rep. No. 77). Tulsa, OK: Hogan Assessment Systems.
76	Hogan, R., Hogan, J., & Stovall, D. (1995). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 76). Tulsa, OK: Hogan Assessment Systems.
75	Hogan, R., & Hogan, J. (1995). *Validity of the Hogan Personality Inventory for selecting salespeople* (Tech. Rep. No. 75). Tulsa, OK: Hogan Assessment Systems.
73	Hogan, R., Hogan, J., & Stovall, D. (1995). *Validity of the Hogan Personality Inventory for the selection of sales representatives* (Tech. Rep. No. 73). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
72	Brinkmeyer, K., & Hogan, J. (1995). *Validity of the Hogan Personality Inventory for selecting police communications operators* (Tech. Rep. No. 72). Tulsa, OK: Hogan Assessment Systems.
71	Hogan, J., & Stovall, D. (1995). *Validity of the Hogan Personality Inventory for selecting licensed practical nurses* (Tech. Rep. No. 71). Tulsa, OK: Hogan Assessment Systems.
70	Hogan, R., Hogan, J., & Brinkmeyer, K. (1995). *Validity of the Hogan Personality Inventory for selecting service operations coordinators* (Tech. Rep. No. 70). Tulsa, OK: Hogan Assessment Systems.
69	Hogan, R., Brinkmeyer, K., & Kidwell, D. (1995). V*alidity of the Hogan Personality Inventory for selecting installers/assemblers* (Tech. Rep. No. 69). TulsaOK: Hogan Assessment Systems.
67	Hogan, R., & Gerhold, C. (1995). *Validity of the Hogan Personality Inventory for selecting managers and assistant managers* (Tech. Rep. No. 67). Tulsa, OK: Hogan Assessment Systems.
66	Hogan, R., & Gerhold, C. (1995). *Validity of the Hogan Personality Inventory for selecting financial consultants* (Tech Rep. No. 66). Tulsa, OK: Hogan Assessment Systems.
65	Hogan, J., Brinkmeyer, K., & Kidwell, D. (1994). *Validity of the Hogan Personality Inventory for selecting machine operators* (Tech. Rep. No. 65). Tulsa, OK: Hogan Assessment Systems.
64	Hogan, R., Hogan, J., & Brinkmeyer, K. (1994). *Validity of the Hogan Personality inventory for selecting drivers* (Tech. Rep. No. 64). Tulsa, OK: Hogan Assessment Systems.
63	Hogan, R., & Gerhold, C. (1994). *Validity of the Hogan Personality Inventory for selecting certified nursing assistants* (Tech. Rep. No. 63). Tulsa, OK: Hogan Assessment Systems.
62	Hogan, J., Brinkmeyer, K., & Kidwell, D. (1994). *Validity of the Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 62) Tulsa, OK: Hogan Assessment Systems.
61	Hogan, R., Hogan, J., Lock, J., & Brinkmeyer, K. (1994). *Validity of the Hogan Personality Inventory for selecting managers* (Tech. Rep. No. 61). Tulsa, OK: Hogan Assessment Systems.
60	Hogan, R., Brinkmeyer, K., & Hogan, J. (1994). *Validity of the Hogan Personality Inventory for employee selection* (Tech. Rep. No. 60). Tulsa, OK: Hogan Assessment Systems.

Tech Rep. Number	Citation
58	Hogan, R., Hogan, J., & Brinkmeyer, K. (1993). *Validity of Hogan Personality Inventory for selecting drivers* (Tech. Rep. No. 58). Tulsa, OK: Hogan Assessment Systems.
56	Hogan, J., & Hogan, R. (1993). *Validity of Hogan Inventory for selecting drivers* (Tech. Rep. No. 56). Tulsa, OK: Hogan Assessment Systems.
37	Arneson, S., Hogan, J., Hogan, R., & Petersons, A. V. (1989). *Development and validation of a clerical associates selection inventory* (Tech. Rep. No. 37). Tulsa, OK: Hogan Assessment Systems.
33	Arneson, S., Millikin-Davies, M., & Hogan, J. (1989). *Development and validation of the claims examiner selection inventory* (Tech. Rep. No. 33). Tulsa, OK: Hogan Assessment Systems.
32	Salas, E., Hogan, J., Driskell, J. E., & Hoskins, B. J. (1988). *Individual differences in technical training: Contributions of noncognitive measures* (Tech. Rep. No. 32). Orlando, FL: Naval Training Systems Center.
20	Hogan, R., Jacobson, G., Hogan, J., & Thompson, B. (1987). *Development and validation of a service operations dispatcher selection inventory* (Tech. Rep. No. 20). Tulsa, OK: Hogan Assessment Systems.
19	Arneson, S., & Hogan, R. (1987). *Development and validation of personnel selection tests for telemarketers and account executives* (Tech. Rep. No. 19). Tulsa, OK: Hogan Assessment Systems.
14	Hogan, R., & Hogan, J. (1986). *Development and validation of an organizational leadership index* (Tech. Rep. No. 14). Tulsa, OK: Hogan Assessment Systems.
11	Hogan, J., Peterson, S., Hogan, R., & Jones, S. (1985). *Development and validation of a line haul driver selection inventory* (Tech. Rep. No. 11). Tulsa, OK: University of Tulsa.
10	Hogan, J., Hogan, R., & Griffith, S. (1985). *Development and validation of a management potential inventory* (Tech. Rep. No. 10). Tulsa, OK: University of Tulsa.
8	Hogan, J., Peterson, S., Hogan, R., & Griffith, S. (1985). *Development and validation of a mechanic selection inventory* (Tech. Rep. No. 8). Tulsa, OK: University of Tulsa.
7	Hogan, J., & Hogan, R. (1984). *Development and validation of a sales representative selection inventory* (Tech. Rep. No. 7). Tulsa, OK: University of Tulsa.
2	Hogan, J., Hogan, R., & Busch, C. (1981) *Development and validation of the nursing aide inventory* (Tech. Rep. No. 2). Baltimore, MD: Johns Hopkins University.

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