

Validity of the Hogan Personality Inventory for the Sales BASIS

Documentation of Evidence for
Validity Generalization

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THE SCIENCE OF PERSONALITY

EXECUTIVE SUMMARY

This report summarizes the research procedures Hogan used to establish the validity of the Hogan Personality Inventory (HPI) for selecting top performers for sales jobs using the Hogan Sales BASIS. This report details the methods used to (a) identify top performers across multiple industries, (b) accumulate validity evidence, and (c) select scales to predict performance in sales jobs.

Hogan used multiple techniques grounded in archival criterion-related validation research to accumulate validity generalization evidence. First, Hogan identified historically valid predictors of job performance using a job family meta-analysis approach. Second, Hogan aligned HPI scales with measures of sales ability for sales jobs across multiple industries using data from the Hogan archive. Finally, based upon these analyses, Hogan calibrated the Sales BASIS profile using a separate sample from the Hogan Archive.

Hogan's validation findings support the predictive validity of the HPI Ambition, Sociability, Interpersonal Sensitivity, and Prudence scales. Hogan recommends using these scales as the basis for the Moderate Fit candidate screening guidelines, which identify candidates who possess at least a minimal degree of the personal characteristics associated with successful sales performance. Analyses using a simulated applicant pool indicate that the recommended Moderate Fit cutoff scores should result in no adverse impact. Hogan also recommends High Fit candidate-screening guidelines comprised of more stringent HPI requirements based on the number of success ranges within the HPI scales. Hogan designed the Sales BASIS to identify the top sales performers (top 16%). Initial estimates indicate that companies using the moderate fit profile will, over time, hire 13% more top sales performers as compared to the low fit profile. Estimates also indicate companies using the high fit profile will, over time, hire 87% more top sales performers as compared to the low fit profile.

Hogan recommends the completion of a local validation study and accumulation of business utility data (when feasible) to evaluate the effectiveness of Sales BASIS assessment results. Until sufficient company-specific assessment and performance data are available, we recommend the use of these results in conjunction with other applicant information to drive selection decisions.

CONTENTS

EXECUTIVE SUMMARY	2
CONTENTS	3
TABLES & FIGURES	5
1 – INTRODUCTION	6
1.1 Foundation	6
1.2 Overview	6
1.3 Study Selection and Dates of Sales BASIS Study	6
1.4 Problem and Setting	7
2 – DESCRIPTION OF SELECTION PROCEDURES	8
2.1 Approach and Rationale	8
2.2 What to Measure and Why	8
2.3 Personality as a Predictor of Important Outcomes	10
2.4 The Hogan Personality Inventory	11
2.5 Hogan Personality Inventory Description and Development	14
3 – META-ANALYSIS RESULTS FOR EVALUATING VALIDITY GENERALIZATION OF PERSONALITY MEASURES	17
3.1 The Five-Factor Model and Job Performance	19
3.2 Personality-Based Validity Coefficient Benchmarking	21
3.3 Summary of Meta-Analysis Results for Generalizing Validity of Five- Factor Model Personality Measures	22
3.4 Meta-Analysis Evidence for Generalizing Validity of the HPI at the Job Family Level	23
4 – CRITERION-RELATED VALIDITY EVIDENCE	25
4.1 Curvilinearity	26
4.2 Criterion-Related Validity Samples	27

5 – RECOMMENDATIONS	31
5.1 Recommended Cutoff Scores.....	31
5.2 Adverse Impact.....	32
5.3 Uses and Applications.....	34
5.4 Accuracy and Completeness.....	35
REFERENCES	36

TABLES & FIGURES

Table 2.1 Correlations between Goldberg’s Big-Five Markers and the HPI Scales	12
Table 2.2 Correlations between the PCI Primary Scales and the HPI Scales ..	12
Table 2.3 Correlations between the IP/5F and the HPI Scales	12
Table 2.4 Correlations between the NEO-PI-R and the HPI Scales	12
Figure 2.1 Relationships between FFM Inventories and the HPI Scales	13
Table 3.1 FFM Meta-Analysis Results: Uncorrected Validity Estimates	19
Table 3.2 Meta-Analysis Results for HPI Scales with Construct-Aligned Criteria	20
Table 3.3 Comparative Validity of Assessments for Predicting Overall Job Performance	21
Table 3.4 Meta-Analysis Results from HPI-Performance Correlations for Sales and Customer Support Jobs	24
Table 4.1 Composition of Sales Criterion Sample by Industry	28
Table 4.2 HPI Means and Standard Deviations	28
Table 4.3 Correlations and Odds Ratios for Initial Cutoff Scores with Sales Ability	29
Figure 4.1 Percentage of Top Sales Performers as a Function of Success Ranges (<i>N</i> = 847)	30
Table 5.1 Summary of Validation Results	31
Table 5.2 Recommended HPI Cutoff Scores	32
Table 5.3 Effects of Applying Two or More Recommended HPI Cutoff Scores to the Hogan Archival Sales Sample—Selection Rates and Adverse Impact Ratios by Demographic Group	34

1 – INTRODUCTION

1.1 Foundation. This report provides a technical summary of research conducted to evaluate the validity of the Hogan Sales BASIS, which is derived from the Hogan Personality Inventory (R. Hogan & J. Hogan, 2007; hereafter “HPI”) to predict performance in sales jobs. The research conforms to standards outlined in the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1978; hereafter “*Uniform Guidelines*”), *The Principles for the Validation and Use of Personnel Selection Procedures* (Society for Industrial and Organizational Psychology, 2003; hereafter “*Principles*”), and the *Standards for Educational and Psychological Testing* (American Educational Research Association, 1999; hereafter “*Standards*”). In areas where the *Uniform Guidelines*, *Principles* and/or *Standards* proved vague or inapplicable, the research approach relied on the broader scientific/professional literature for guidance.

1.2 Overview. We organized this document in the following sections:

- ***Introduction*** – project overview
- ***Description of Selection Procedures*** – review of predictors
- ***Meta-Analysis Results for Evaluating Validity Generalization of Personality Measures*** – review of meta-analysis literature
- ***Criterion-Related Evidence*** – predicting top sales performers
- ***Recommendations*** – application recommendations

1.3 Study Selection and Dates of Sales BASIS Study As an international authority in personality assessment and consulting, Hogan has over 25 years of experience helping businesses dramatically reduce turnover and increase productivity by hiring the right people, developing key talent, and evaluating leadership potential. The Hogan archive contains hundreds of studies from the past 25 years from which we were able to conduct the study for the Sales BASIS.

Hogan conducted research described in this report between April 2011 and April 2012. Hogan identified 29 criterion validation studies for sales jobs, representing 3,776 sales men and women across multiple industries. Within these studies, Hogan had collected objective sales data and measures of overall job performance data (e.g., supervisor performance ratings). In the sample, 874 cases were not missing any data. Consequently, Hogan used this sample to create the initial recommendations. Hogan further calibrated the Sales BASIS using a sample of 17,150 sales men and women across multiple industries.

1.4 Problem and Setting. Using a valid selection process that can identify high potential candidates is critical for selecting talented employees who will contribute to the long-term success of the company. The complexities of recruiting and the dynamic job market warrant continuous evaluation and improvement of an organization's selection process.

Alternative candidate selection techniques such as application blanks, background credit and criminal reports, and reference checks, are often not sufficient for selecting top sales performers. An assessment of personality characteristics could enhance selection procedures used to screen sales jobs candidates.

2 – DESCRIPTION OF SELECTION PROCEDURES

2.1 Approach and Rationale. Validating any selection instrument relies on accurate measurement. Measurement consists of any procedure that assigns numbers systematically to characteristic features of people according to explicit rules (Ghiselli, Campbell, & Zedeck, 1981). Professionals use these numbers to make predictions or forecast future behavior(s). Assigning numbers in a systematic fashion to characteristics is a necessary, but not sufficient, requirement of any pre-employment selection tool. Every instrument should also provide evidence to support (a) the reliability of the instrument and (b) relationships between scores on the instrument and job-relevant behaviors or outcomes (Equal Employment Opportunity Commission, 1978). At a minimum, professionals should evaluate the reliability of assessments 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).

Test publishers should document an assessment's ability to predict job-relevant behaviors or outcomes in credible scientific sources. The supporting evidence should include significant and interpretable relations between scores on the instrument and indices of job performance. Moreover, evidence should also demonstrate scores on the instrument predict job performance criteria critical to success in the job of interest, rather than an ability to predict performance outcomes unrelated to critical work or behaviors.

Assessment instruments should also be "fair," in that they should not discriminate unfairly on the basis of gender, age, or race (Equal Employment Opportunity Commission, 1978). As such, professionals must validate selection procedures that result in adverse impact in accordance with the *Uniform Guidelines*. Unfortunately, many instruments currently used in applied contexts fail to meet the criteria outlined above (R. Hogan, J. Hogan, & Trickey, 1999).

2.2 What to Measure and Why. Based on Hogan's desire to evaluate the validity of personality inventories, and more specifically the Sales BASIS, for assisting in the sales job selection process, the following summary briefly describes measurement issues that have influenced the current effort. For personality assessment, the most important question is "*What should we measure?*" Historically, the answer depended on an 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; Briggs-Meyers, McCaulley, Quenk, & Hammer, 1998; Thematic Apperception Test; Morgan & Murray, 1935). Multi-dimensional personality inventories developed during the 1940s and 1950s measured traits, or hypothetical structures believed to underlie differences in social behavior (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 reflect five broad personality dimensions. The Five-Factor Model (FFM; cf. 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 provides the starting point for several prominent personality inventories constructed within the last twenty years (e.g., NEO-PI: Costa & McCrae, 1992; HPI: R. Hogan & J. 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 conform, with little difficulty, to these five dimensions (Wiggins & Pincus, 1992). Consequently, the FFM represents the dominant paradigm for current research in personality assessment (De Raad & Perugini, 2002; R. Hogan & J. Hogan, 1995, 2007).

The FFM rests on observer's descriptions of others. These observations form the basis of one's reputation, or how people describe coworkers or peers (R. 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, or view of him or herself (cf. Goffman, 1958). Reputations are public, tell us about observable tendencies behavior, can be measured reliably, and can be used to forecast future behavior (cf. Emler, 1990). Consequently, a person's

reputation represents an invaluable source of information about work-related strengths and shortcomings and influences the direction of careers.

2.3 Personality as a Predictor of Important Outcomes. Personality assessment samples self-presentational behavior, or how a person portrays him or herself to others on the job. Using an assessment instrument for measurement purposes 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. More importantly, personality measurement provides highly meaningful information, as previous research shows that personality predicts numerous work and non-work related outcomes. Recently, Hough and Oswald (2008) provided a summary of the value of applied personality assessment.

For example, personality predicts a number of major life outcomes, such as academic achievement, mortality, divorce, subjective well-being, and occupational attainment (Lievens, Ones, & Dilchert, 2009; O'Connor & Paunonen, 2007; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Rothstein, Paunonen, Rush, & King, 1994; Steel, Schmidt, & Shulz, 2008). Research also demonstrates that personality predicts health-related behaviors including the use of drugs and alcohol (Bogg & Roberts, 2004; Cooper-Hakim & Viswesvaran, 2002; Paunonen, Haddock, Forsterling, & Keinonen, 2003; Roberts, Chernyshenko, Stark, & Goldberg, 2005). Illustrating the value of personality across contexts, Ozer and Benet-Martinez (2006) noted that, at an individual level, personality dispositions relate to happiness, physical and psychological health, spirituality, and identity. At an interpersonal level, the authors also found personality related to the quality of peer, family, and romantic relationships. Finally, at a social/institutional level, personality relates to occupational choice, satisfaction, performance, community involvement, criminal activity, and political ideology (Ozer & Benet-Martinez, 2006).

Additional research illustrates the value of personality for predicting work-related outcomes. For example, researchers consistently find that personality predicts overall job performance (e.g., Barrick, Mount, & Judge, 2001; Dudley, Orvis, Lebiecki, & Cortina, 2006; J. Hogan & Holland, 2003), task performance (Dudley et al., 2006; Hurtz & Donovan, 2000), expatriate performance (Mol, Born, Willemsen, & Van Der Molen, 2005) and performance in teams (Peeters, Van Tuijl, Rutte, & Reymen, 2006). Also, personality predicts a range of contextual performance variables including Organizational Citizenship Behaviors (OCBs), altruism, job dedication, interpersonal facilitation, and generalized compliance (Borman, Penner, Allen, & Motowidlo, 2001; Dudley et al., 2006; Hurtz & Donovan, 2000; LePine, Erez, & Johnson, 2002; Organ & Ryan, 1995).

Regarding specific work skills and individual competence, researchers report that personality predicts training performance and skill acquisition (Barrick &

Mount, 1991; Barrick et al., 2001; Colquitt, LePine, & Noe, 2000), goal setting (Judge & Ilies, 2002; Steel, 2007), creativity and innovation (Feist, 1998; Furnham, Crump, Batey, & Chamorro-Premuzic, 2009; Hough, 1992; Hough & Dilchert, 2007), teamwork (Barrick, Mount, & Gupta, 2003; J. Hogan & Holland, 2003), and job and career satisfaction (Judge, Heller, & Mount, 2002; Ng, Eby, Sorensen, & Feldman, 2005). Among leaders and managers, personality shows significant correlations with overall managerial effectiveness, promotion, and managerial level (Hough, Ones, & Viswesvaran, 1998), as well as leader emergence and effectiveness (Bono & Judge, 2004; Judge, Bono, Ilies, & Gerhardt, 2002).

Organizations can use personality measures to identify employees likely to engage in Counterproductive Work Behaviors (CWBs), or behaviors that violate the norms of an organization and cause harm to the organization itself, specific members of the organization, or both (Berry, Ones, & Sackett, 2007; Gruys & Sackett, 2003). Personality-based integrity tests predict more specific negative outcomes such as theft, disciplinary actions, and absenteeism (Ones, Viswesvaran, & Schmidt, 1993, 2003).

Considering the applied value of personality in predicting a range of important business-related outcomes, as well as the robustness of these measures against the pitfalls of adverse impact and faking, it is advantageous for organizations to use personality assessment to predict meaningful job performance outcomes. In addition, evaluations of predictive effectiveness and operational validity of assessment inventories are essential to demonstrate business necessity. The next section describes the Hogan Personality Inventory (HPI), a reliable, valid, and well-established assessment instrument.

2.4 The Hogan Personality Inventory. The HPI was the first measure of normal personality developed explicitly to assess the FFM in occupational performance. 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 considered a marker instrument in English and other languages as well.

To illustrate the relationships between the HPI and other well-known personality assessments, Tables 2.1 through 2.4 present correlations between the HPI and other assessments of the FFM. Figure 2.1 shows median correlation coefficients that summarize HPI relations with Goldberg's (1992) Big-Five Markers (R. Hogan & J. Hogan, 2007), the Personal Characteristics Inventory (Mount & Barrick, 1995), the Inventario de Personalidad de Cinco Factores (IP/5F: Salgado & Moscoso, 1999), and the NEO PI-R (Goldberg, 2000).

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

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

Note. N = 168. Table taken from the *HPI Manual* (R. Hogan & J. Hogan, 2007). Factor I = Surgency; Factor II = Agreeableness; Factor III = Conscientiousness; Factor IV = Emotional Stability; Factor V = Intellect; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach. * $p < .05$, 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; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive. * $p < .05$.

Table 2.3 Correlations between the IP/5F and the HPI Scales

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*

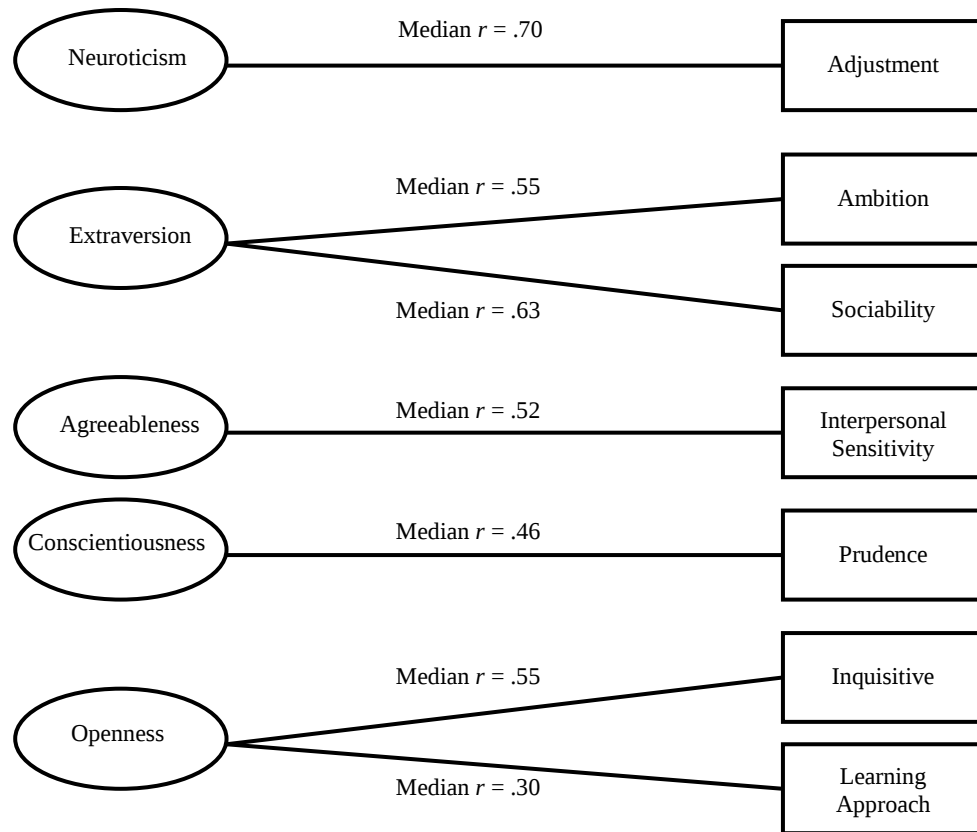
Note. N = 200. ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive. * $p < .05$.

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; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach. * $p < .05$.

Figure 2.1 Relationships between FFM Inventories and the HPI Scales



Note. Median correlation coefficients summarize HPI relations with the NEO PI-R (Goldberg, 2000), Goldberg's (1992) Big-Five Markers (R. Hogan & J. Hogan, 2007), 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). Reprinted with permissions from the authors. All rights reserved.

2.5 Hogan Personality Inventory Description and Development.

HPI Description

- 206 true/false items with no psychiatric content.
- 7 personality scales, 1 validity scale, no item overlap.
- 4th grade reading level.
- 15-20 minute completion time.
- Items carefully screened to minimize invasion of privacy.
- Designed for ages 18 and above.
- Internet administration and reporting.

HPI Development

- Based on the FFM, development of the HPI began in the late 1970s, with construction and validation conducted in accordance with professional standards and the *Uniform Guidelines*.
- Favorable reviews of the HPI appear in the Buros Institute of Mental Measurements, the 13th edition of the Mental Measurements Yearbook (Lobello, 1998), and the British Psychological Society Psychological Testing Centre Test Reviews (Creed & Shackleton, 2007; Marshall & Lindley, 2009). Additional objective reviews for the HPI exists with the Oregon Research Institute (Goldberg, 2008).
- HPI norms include data from over 150,000 working adults and job applicants from a variety of industry sectors including healthcare, military services, transportation, protective services, retail, manufacturing, and hospitality. This normative sample is representative of 14 of the 23 U.S. Department of Labor occupational categories.
- Over 250 validation studies, evaluating occupational performance across jobs and industries, have used the HPI. Jobs studied represent 95% of the industry coverage of the Dictionary of Occupational Titles (U.S. Department of Labor, 1991).
- Meta-analyses of HPI scales indicate that the estimated true scale validities for predicting job performance are as follows: 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* (J. Hogan & Holland, 2003).
- To date, research indicates no adverse impact for the HPI on protected racial/ethnic, gender, or age groups.

- Recent research indicates that real job applicants who completed the HPI as part of the job application process did not/could not “fake” their scores on a second occasion having been rejected the first time (J. Hogan, Barrett, & Hogan, 2007). Further, McGrath, Mitchell, Kim, and Hough (2010) found no evidence that participants distort results just for the sake of it.
- The HPI incorporates the FFM with an internal factor structure supporting seven scales. The test-retest reliabilities range from .69 to .87. The 2007 *Hogan Personality Inventory Manual* (3rd edition) documents the background, development, and psychometric properties of the inventory.
- HPI scales demonstrate adequate psychometric qualities (Lobello, 1998). Items retained in the final battery predict significant non-test behavior. 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. Overall, the HPI is a well-validated instrument that predicts job performance across occupations and organizations (Axford, 1998; J. Hogan & Holland, 2003).
- The HPI was included in research conducted by the Oregon Research Institute in 1997 and 2007. This research effort is the largest of its kind and it compiles longitudinal data on major personality assessments from a community sample in Eugene-Springfield, Oregon. The data collected is a comprehensive and objective source of validity evidence for the HPI. The results of these two studies indicate that the HPI has sufficient convergent and discriminant validity with other FFM measures (Goldberg, 2008).

Constructs Measured

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

Adjustment concerns the degree to which a person is steady in the face of pressure, or conversely, moody and self-critical (FFM: Emotional Stability).

Ambition concerns the degree to which a person seems leaderlike, status-seeking, and achievement-oriented (FFM: Extraversion).

Sociability concerns the degree to which a person needs and/or enjoys social interaction (FFM: Extraversion).

Interpersonal Sensitivity concerns the degree to which a person has social sensitivity, tact, and perceptiveness (FFM: Agreeableness).

Prudence concerns the degree to which a person seems conforming, dependable and has self-control (FFM: Conscientiousness).

Inquisitive concerns the degree to which a person seems imaginative, adventurous, and analytical (FFM: Intellect/Openness).

Learning Approach reflects the degree to which a person enjoys academic activities and values education as an end in itself (FFM: Intellect/Openness).

In terms of instrument development, an initial pool of 420 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).

3 – META-ANALYSIS RESULTS FOR EVALUATING VALIDITY GENERALIZATION OF PERSONALITY MEASURES

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 was due to statistical and procedural factors (Guion, 1998, p. 368) — idiosyncratic factors that could be ignored or statistically corrected.

Many psychologists now agree that “validity” is a unitary concept, not a type of method or an attribute of a test. Guion and Highhouse (2006, p. 134) define validity as “a property of the inferences drawn from test scores.” In addition, many psychologists now agree that more ways exist to assess the validity of inferences from test scores than a specific local study of their relationship with job relevant criteria (McPhail, 2007). When available, researchers may use Validity Generalization (VG) evidence 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).

Schmidt and Hunter (1977) 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 (Hunter, 1980; Schmidt & Hunter, 1977), biographical data inventories (Schmidt & Rothstein, 1994), personality inventories (Barrick & Mount, 1991; Barrick, Mount, & Gupta, 2003; Berry et al., 2007; Dudley, Orvis, Lebiecki, & Cortina, 2006; J. Hogan & Holland, 2003; Judge, Bono, Ilies, & Gerhardt, 2002; Salgado, 1997, 1998; Tett, Jackson, & Rothstein, 1991), assessment center exercises (Arthur, Day, McNelly, & Edens, 2003; Meriac, Hoffman, Woehr, & Fleisher, 2008), and situational judgment tests (McDaniel, Morgeson, Finnegan, Campion, & Braverman, 2001) generalize across 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). Of the three VG methods, meta-analysis provides the most generalizable results, but 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 research as source data. J. Hogan et al. (2007) demonstrate the use of all three methods in combination.

Meta-analysis averages findings from multiple studies of the same relationship to provide a best estimate of ρ (i.e., the population correlation) by controlling for error due to sampling, measurement range restriction, and unreliability in predictor and criterion measures (Smith & Glass, 1977). In addition, meta-analyses include carefully developed 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 researchers are less likely to publish studies with insignificant results. Rosenthal (1979) notes that such omissions are problematic for meta-analysis research as they produce results based on too 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. J. Hogan and Holland (2003) did the same using a domain skills model as the basis for a meta-analysis of the validity of personality predictors (see Table 3.2). 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. The next section reviews evidence accumulated from large-scale meta-analyses and empirical studies that support the proposition that personality measures are valid predictors of job performance across occupational groups.

3.1 The Five-Factor Model and Job Performance. Table 3.1 presents the results of six, large-scale meta-analyses summarizing relations between the FFM scales and overall job performance. 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 correlation coefficients are generally smaller than those of the Conscientiousness/Prudence scale.

Table 3.1 FFM Meta-Analysis Results: Uncorrected Validity Estimates

Study	FFM Scales						
	1	2	3	4	5	6	7
A.	.15	.10	.10	.22	.12	.18	.18
B.	.05	.01	.01	.04	.12	.01	.01
C.	.09	.05	.05	.01	.10	.04	.04
D.	.09	.06	.06	.07	.14	.04	.04
E.	.25	.20	N/A	.18	.22	.20	.15
F.	.17	.22	.22	.06	.20	.16	.16

Note. 1 = Emotional Stability/Adjustment; 2 = Ambition/Extraversion; 3 = Extraversion/Sociability; 4 = Interpersonal Sensitivity/Agreeableness; 5 = Conscientiousness/Prudence; 6 = Openness/Inquisitive; 7 = Openness/Learning Approach. A = Tett, Jackson, & Rothstein (1991). Sample sizes = 280 (Agreeableness) to 2,302 (Extraversion). B = Barrick & Mount (1991). Sample sizes = 3,694 (Emotional Stability) to 4,588 (Conscientiousness). C = Salgado (1997). Sample sizes = 2,722 (Openness) to 3,877 (Emotional Stability). D = Hertz & Donovan (2000). Sample sizes = 5,525 (Openness) to 8,083 (Conscientiousness). E = J. Hogan & Holland (2003). Sample sizes = 1,190 (Inquisitive) to 3,698 (Ambition). F = Judge et al. (2002). Sample sizes = 7,221 (Openness) to 11,705 (Extraversion); N/A = Not Available.

Unlike earlier meta-analyses, which evaluated the validity of the FFM in relation to indices of overall performance, J. Hogan and Holland (2003) aligned the FFM scales with performance criteria. Prompted by earlier calls for research (Ashton, 1998; J. Hogan & Roberts, 1996; Paunonen, Rothstein, & Jackson, 1999), J. Hogan and Holland meta-analyzed 43 independent samples ($N = 5,242$) included in studies using the HPI (see Table 3.2). For this analysis, J. Hogan and Holland aligned HPI scales with criterion measures reflecting FFM themes. The relations between HPI scales and overall performance ratings proved stronger than previous FFM research. Results indicated the following operational validities: Adjustment = .37, Ambition = .31, Interpersonal Sensitivity = .25, Prudence = .31, Inquisitive = .29, Learning Approach = .22. As shown in Table 4.2, the fully corrected

correlation coefficients ranged from .25 (HPI Learning Approach) to .43 (HPI Adjustment).

Table 3.2 Meta-Analysis Results for HPI Scales with Construct-Aligned Criteria

HPI Scale	N	K	r_{obs}	ρ_v	ρ
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; ρ_v = operational validity corrected for range restriction and criterion unreliability; ρ = true validity at scale level corrected for range restriction and predictor-criterion unreliability; N/A indicates insufficient data to compute meta-analysis. All observed correlations are statistically significant at $p < .05$.

In application, organizations should use multiple personality scales to screen job applicants. The rationale for using multiple scales is to account for the various personal characteristics necessary for success, as any one scale is unlikely to map the entire performance domain of any job. J. Hogan and Holland (2003) illustrate the value of using multiple scales. For example, to predict criteria concerning the ability to tolerate stress, the HPI Adjustment scale is the best single predictor. However, to predict resourceful problem solving or the ability to generate creative solutions, the HPI Inquisitive scale yields the largest validity coefficient. In addition to using multiple personality scales to predict performance, Schmidt and Hunter (1998) provided evidence supporting incremental validity of personality measures over General Mental Ability (GMA), or “g.” In reviewing over 85 years of selection research, Schmidt and Hunter showed that adding a measure of Conscientiousness to GMA tests improved validity by 18%. Furthermore, the addition of an integrity measure to GMA improved validity by 27%, the largest increment across 18 other selection measures (e.g., work sample tests, interviews, job knowledge, biographical data, and assessment centers).

Across studies represented in Tables 3.1 and 3.2, the meta-analysis results support the generalizability of the Conscientiousness/Prudence, Emotional Stability/Adjustment, and Agreeableness/Interpersonal Sensitivity measures across occupations and industries. Moreover, the results from J. 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 FFM measures (Conscientiousness, Emotional Stability, and Agreeableness) in general, and six of the seven HPI scales in particular.

3.2 Personality-Based Validity Coefficient Benchmarking. Criteria used to designate a “meaningful” predictor-criterion correlation remain poorly defined. Consequently, researchers define the meaningfulness of a correlation solely on its magnitude, which is reasonable but not sufficient. Interpreting the usefulness of a correlation coefficient based solely on magnitude is one strategy, since 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? Rather than focus exclusively on the magnitude of observed correlation coefficients, a benchmarking strategy is more appropriate.

The assessment literature includes many studies that evaluate the validity of the FFM personality measures across jobs, organizations, and industry types. Hough and Oswald (2008) summarize some of the major findings. These studies reflect the appropriate benchmark from which to evaluate the validity of the FFM scales. By comparing validity coefficients found in this technical report to the validity coefficients reported in the peer-reviewed literature, it is possible to derive some general conclusions about the validity and utility of potential personality predictors of job performance.

To establish a benchmark from which to compare the generalized validity coefficients presented in this report, Table 3.3 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 only $r = .21$. Relative to the sample-weighted validity coefficients reported by J. Hogan and Holland (2003), the validity of GMA appears less predictive of construct-oriented criteria (not overall supervisory ratings of job performance) than the HPI Adjustment and Prudence scales.

Table 3.3 Comparative Validity of Assessments for Predicting Overall Job Performance

Study	Predictor	r_{obs}
A.	Conscientiousness Tests	.18
B.	Integrity Tests	.21
C.	Structured Interviews	.18
D.	Unstructured Interviews	.11
E.	Situational Judgment Tests	.20
F.	Biodata	.22
G.	General Mental Ability	.21
H.	Assessment Centers	.28
I.	Resumes	.18

Note. r_{obs} = mean observed validity; A = Mount & Barrick (2001). B = Ones, Viswesvaran, & Schmidt (1993). C & D = McDaniel, Whetzel, Schmidt, & Maurer (1994). E = McDaniel, Hartman, Whetzel, & Grubb (2007). F = Bliesener (1996). G = Pearlman, Schmidt, & Hunter (1980). H = Arthur et al. (2003). I = O’Leary (2009).

Also noteworthy are the validity coefficients of FFM scales reported in five other meta-analyses (see Table 3.1). Excluding J. Hogan and Holland's (2003) results, the validity of Emotional Stability measures ranges between .05 (Barrick & Mount, 1991) and .17 (Judge et al., 2002). A similar pattern exists for Conscientiousness measures, with validity coefficients ranging between .10 (Salgado, 1997) and .20 (Judge et al., 2002). For the remaining FFM scales, only Tett et al. (1991) and Judge et al. report validity coefficients at or above .10.

J. Hogan and Holland (2003) present validity coefficients (see Table 3.2) that are, on average, 24% larger in magnitude than the highest correlation coefficients reported in previous personality-based meta-analyses. There are three important differences between the J. Hogan and Holland study and other studies. First, they aligned predictors with indices of job performance. J. Hogan and Holland reasoned that personality scales are not designed to be omnibus predictors of job performance, but rather to predict *facets* of job performance. By matching predictors and performance criteria, the observed validities increased. Campbell (1990) articulated this construct alignment strategy, although it is seldom used. Second, most early studies evaluating the validity of FFM personality scales relied on classification schemes to translate scales from non-FFM instruments (e.g., California Psychological Inventory) into the FFM domains. During the classification process, raters misclassified scales into FFM dimensions. When errors like this occur, validity decreases. Finally, J. Hogan and Holland relied on a single personality tool (HPI), which eliminated the possibility of coding or classification errors. Together these three factors help untangle the personality literature and establish the appropriate benchmark from which to evaluate the validity of personality scales in occupational settings.

3.3 Summary of Meta-Analysis Results for Generalizing Validity of Five-Factor Model Personality Measures. Researchers are skeptical about the merits of some procedures used in meta-analyses. In particular, they believe corrections can be used inappropriately to overestimate predictor-criterion relationships. Nonetheless, the meta-analyses described above provide lower bound estimates of the validity of personality measures for predicting job performance. Reviewing the research on meta-analysis evidence permits certain conclusions. First, meta-analysis results strongly support the validity of Conscientiousness measures for predicting various job criteria, including overall job performance. Second, evidence to support the generalized validity of Emotional Stability and Agreeableness for job performance is moderate to strong, particularly as the criterion becomes more saturated with requirements for interpersonal skill(s). Lastly, the validity coefficients for Extraversion/Surgency measures (particularly the HPI Ambition scale) are strong for predicting criteria associated with achieving results and leading others. The remaining Five Factor dimension — Intellect/Openness to

Experience — is not as generalizable as the others because it is relevant for a smaller range of jobs and criteria.

Based on meta-analysis results for personality measures, we conclude that an assessment of Conscientiousness, Emotional Stability, and Agreeableness should generalize and predict performance for sales jobs. This is consistent with the empirical literature (e.g., Barrick, Mount, & Judge, 2001) and the next section reviews evidence accumulated from a meta-analysis conducted at the job family level based on the Hogan archive.

3.4 Meta-Analysis Evidence for Generalizing Validity of the HPI at the Job Family Level. The Hogan archive contains hundreds of studies examining jobs classified into seven job families. Based on studies within each job family, we meta-analyzed validity coefficients for each HPI scale. Hogan used the procedures specified by Hunter and Schmidt (1990) to accumulate results across studies and assess effect sizes. All studies used zero-order product-moment correlations, which eliminated the need to convert alternative statistics to values of r . We report operational validities, which we have corrected for sampling error, unreliability in the criterion measure, and range restriction. We did not correct correlation coefficients for predictor unreliability 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, Hogan believes it is premature to estimate the validity of a perfect construct when there is no firm agreement on the definition of the construct itself. Results, therefore, represent relationships between HPI scales and job performance.

Hunter and Schmidt (1990) argue that samples should contribute the same number of correlations to meta-analysis results to avoid bias. Thus, Hogan selected only one correlation per study so that each sample contributed only one point estimate per predictor scale. Hogan also computed a range restriction index for HPI scales. Following procedures described by Hunter and Schmidt (1990), Hogan divided each HPI scale's within-study standard deviation by the standard deviation reported by R. Hogan and J. Hogan (1995). This procedure produced an index of range restriction for each HPI scale for each study. We used mean replacement within job family to estimate range restriction correction factors when within study standard deviation was unavailable.

Although some researchers (e.g., Murphy & De Shon, 2000) argue against the use of rater-based reliability estimates, Hogan followed procedures outlined by Barrick and Mount (1991) and Tett et al. (1991), and used the .508 reliability coefficient proposed by Tett et al. (1991) to estimate the reliability of supervisory ratings of job performance. Based upon job analysis information, sales positions fall into the "Sales and Customer Support" job family, encompassing those jobs that require individuals to have responsibility for

building the credibility of the organization through interacting and establishing long-lasting relationships with clients. Hogan has accumulated a number of criterion-related studies for this job family.

Hogan identified 51 relevant criterion-related studies in the Hogan archive that served as a foundation for establishing meta-analysis evidence of the validity of the HPI for predicting job performance. Table 3.4 contains the operational validities between overall performance and each HPI scale. Consistent with previous research (see section 3.2) and specific to sales and customers jobs, the HPI Adjustment, Ambition, and Sociability (FFM Emotional Stability and Extraversion) scales best predict overall performance. Interpersonal Sensitivity, Prudence, and Learning Approach (FFM Agreeableness, Conscientiousness, and Openness [in part]) may also predict performance for some Sales and Customer Support jobs.

Table 3.4 Meta-Analysis Results from HPI-Performance Correlations for Sales and Customer Support Jobs

	K	N	ADJ	AMB	SOC	INP	PRU	INQ	LRN
Overall Performance	51	3,763	.10*	.28*	.12*	.06*	.06*	.05	.07*

Note. Results presented in the table are operational validities; * = 95% confidence interval did not include 0; K = number of studies; N = number of participants across K studies; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INP = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LRN = Learning Approach.

4 – CRITERION-RELATED VALIDITY EVIDENCE

The personality profiles that predict success for two similar positions may differ depending on the necessary job requirements. In addition, what is defined as successful job performance may differ slightly between two similar jobs. The meta-analytic results above merge both support and sales jobs, yet these roles may vary in their specific personality requirements. For example, successful sales and support jobs both require an interpersonal orientation; however, a truly excellent salesperson may need to be more self confident, competitive, and attention seeking than a support person. Conversely, a support person may need to be friendly, patient, and cooperative.

Consequently, the next step in the research process involved pooling and analyzing criterion studies for sales jobs only from the Hogan archive. Aguinis, Henle, and Ostroff (2001) described criterion-related validity in terms of the relationship between the predictor (e.g., HPI Scales) and some criterion measure (e.g., job performance), with the goal of answering the basic question: how accurate are test scores in predicting criterion performance? The *Uniform Guidelines* state “evidence of the validity of a test or other selection procedure by a criterion-related validity study should consist of empirical data demonstrating that the selection procedure is predictive of or significantly correlated with important elements of job performance” (29 C.F.R. § § 1607.5 (B)).

Although there are many organizational and logistical constraints that limit the usefulness of criterion-related validity studies (McPhail, 2007), the *Uniform Guidelines* and *Principles* suggest considering this approach when a) there is an adequate, representative sample of job incumbents willing to participate, and b) development of reliable, unbiased measures of job performance is possible. The *Principles* also recommends using a relevant criterion measure, one that “reflects the relative standing of employees with respect to important work behavior(s) or outcome measures(s)” (p. 14).

Additional factors should be taken into account and used as a guide when determining whether a criterion-related validity study is appropriate to use in any given selection situation. First, practitioners should consider the design when planning the study. A predictive design predicts scores on a criterion measured at some future occurrence. For example, job applicants complete the assessment before being hired and provide measures of performance after being on the job for some time. Concurrent designs are more practical because they do not require a time delay; instead, the organization collects job performance information at the same time job incumbents complete the assessment battery. Only one empirical study has examined the effects of these two strategies on criterion-related validity using personality measures. Van Iddekinge and Ployhart’s (2008) review of criterion study design revealed that predictive designs produce slightly lower validity estimates than

concurrent designs. Yet regardless of the strategy employed, the predictive value of the assessment is established by correlating assessment scores and job performance data, and other factors beyond study design may still influence this validity coefficient.

For example, the *Principles* note that this observed validity coefficient “may underestimate the predictor-criterion relationship due to the effects of range restriction and unreliability in the predictors and/or criterion.” As a result, adjustments are available to account for these artificial reductions in variance. For instance, researchers often correct for criterion unreliability to estimate operational validity (Van Iddekinge & Ployhart, 2008). Note that Hogan corrects for measurement error and range restriction where appropriate and reports both the observed and corrected validity coefficients in our technical documentation.

Another decision researchers face is whether to use a single criterion or multiple criteria during the data collection phase of the criterion study. The literature recommends that researchers “develop criterion measures that are conceptually aligned with the latent criterion constructs and that maximize the potential use of multiple criteria for predictor validation” (Van Iddekinge & Ployhart, 2008, p. 906). Furthermore, Hogan and Holland (2003) provide strong support for using specific criteria to estimate the validity of specific predictors in operational use. Although support for using narrow criteria is growing, collecting overall performance composites still provide the best approach to estimating validity of global predictors (Guion, 1961) and prediction improves when criterion ratings cover the full spectrum of effective performance (Oh & Berry, 2009). Researchers should continue using global criteria in the design of their performance rating forms, yet should strongly consider using specific dimensions when practical and made available.

4.1 Curvilinearity. Recent research suggests non-linear effects between personality and job behaviors (Vasilopoulos, Cucina, & Hunter, 2007). This indicates being moderate on a certain characteristic may be more optimal for performance than being very high or very low (i.e., an inverted-U shape relationship). In certain cases, an overabundance of certain characteristics can be indicative of poor interpersonal adjustment and predictive of derailment (Hogan & Hogan, 2001). Being ambitious and assertive, for instance, positions oneself as noticeable and leads to first claim on a potential client or resource. However, being overly bold can lead to foolhardiness, and expose oneself to unwanted attention and conflict with others. Evidence for curvilinearity suggest the importance of using a double cutoff score strategy (setting both lower and upper limits) to screen applicants. In some instances, using cutoff scores that remove individuals that are both low and high on a scale can improve the utility of the personality assessments. Applying this system necessitates determining an appropriate

upper end cutoff score relative to where predicted job performance declines below an acceptable level.

Within sales, Prudence and Interpersonal Sensitivity are the two most likely to have curvilinear effects. At a minimal level, both are important for effective sales performance, but may become disruptive beyond a certain threshold. Individuals higher in conscientiousness (similar to Prudence) tend to be more motivated to perform on the job and therefore achieve better performance through careful planning, goal setting, and persistence (Judge & Ilies, 2002). However, after a certain point, high conscientiousness may no longer be helpful to performance because excessively conscientious persons can be considered rigid, inflexible, compulsive perfectionists (Tett, 1998). Moscoso and Salgado (2004) argued extreme levels of conscientiousness may not be beneficial to job performance, “because the maladaptive tendencies of conscientiousness (compulsive style) produce an interference with practices considered as signs of a good quality job” (p. 360). Agreeableness (similar to Interpersonal Sensitivity), reflects people who are likeable, pleasant, and harmonious in relationships with others, but is not consistently related with sales performance (Barrick & Mount, 1991). This inconsistency may be indicative of curvilinearity (Graziano & Eisenberg, 1997). In one respect, being too high on agreeableness leads to accommodating behaviors which may result in failure to close sales; in contrast, being low on agreeableness is associated with manipulative and deceitful tactics which undermine long-term relationships necessary for ongoing customer relations (e.g., Warr, Bartram, & Martin, 2005). Together, this evidence suggests a midrange level of Prudence and Interpersonal Sensitivity may be optimal for top sales performance.

4.2 Criterion-Related Validity Samples Hogan conducted a pooled criterion-related validity study by combining studies for sales positions that had both assessment (i.e., HPI) and sales ability data (i.e., supervisor performance ratings). Unlike meta-analysis, which analyzes effect sizes from multiple studies (e.g., correlations), pooled techniques involve statistical analyses of a single data set that consists of two or more combined samples. This technique allows for the examination of profiles consisting of multiple scales across multiple studies whereas meta-analysis can only examine one predictor at a time. Further, pooled techniques have the advantage of being more precise by conducting the analyses on the original data.

Hogan identified a sub-set of studies within the archive containing supervisory assessments of employees’ sales ability, defined as the effective demonstration, promotion, and selling of products and services. Sales ability is one of 62 broad competencies identified in the Hogan Competency Model (Hogan Assessment Systems, 2009), an integrative competency framework built from 21 published and practitioner models of work performance. As mentioned above, increased alignment between performance criteria and personality scales can increase validity and specificity, thus providing greater

utility in selecting for a specific position (Bartram, 2005). Hogan standardized the subjective ratings of sales ability within each study to place them on a common metric comparable across studies.

The sample used to determine the initial cutoff scores represented eleven companies ($N = 847$) across eight industries. Based upon percentiles of overall sales ability the sample included 14.9% low performers, 36.7% below average performers, 33.2% above average performers, and 15.2% high performers. Hogan had collected the data between the dates of 1991 and 2011. Table 4.1 shows the frequency of sales positions broken down by industry.

Table 4.1 Composition of Sales Criterion Sample by Industry

Study #	Frequency	Percent
Agriculture	90	11
Communication	32	4
Consulting Services	108	13
Financial Services	114	13
Leisure & Hospitality	38	5
Pharmaceutical	241	29
Technology	128	15
Transportation	96	11

Note. $N = 847$; Percent = Percent of overall sample; does not total 100 due to rounding error

Table 4.2 shows the HPI raw score means and standard deviations for the pooled sales job samples.

Table 4.2 HPI Means and Standard Deviations

Scale	M	Total Possible	SD
HPI Adjustment	22.74	37	8.35
HPI Ambition	21.77	29	5.88
HPI Sociability	13.23	24	5.61
HPI Interpersonal Sensitivity	18.28	22	3.44
HPI Prudence	17.49	31	6.51
HPI Inquisitive	13.31	25	5.04
HPI Learning Approach	8.40	14	3.03

Note. HPI $N = 847$; M = Mean, SD = Standard Deviation.

Table 4.3 displays the uncorrected correlations between the HPI scales and sales ability. In addition, odds ratios were calculated comparing low and high performers to passers vs. non-passers using optimal cutoff scores. When odds ratios exceed 1.00, there is a greater than chance likelihood the individuals meeting the cutoff score criteria will be a top sales performer.

Table 4.3 Correlations and Odds Ratios for Initial Cutoff Scores with Sales Ability

Sales Ability	ADJ	AMB	SOC	INT	PRU	INQ	LEA
Correlation	.02	.09*	.05*	.01	.00	.00	.03
Cutoff Scores	-	≥ 50%	≥ 70%	5% - 79%	8% - 79%	-	-
Odds Ratios	-	1.90	1.35	1.13	1.27	-	-

Note. Overall Sales Ability $N = 847$; ADJ = Adjustment; AMB = Ambition; SOC = Sociability; INT = Interpersonal Sensitivity; PRU = Prudence; INQ = Inquisitive; LEA = Learning Approach; * $p < .05$.

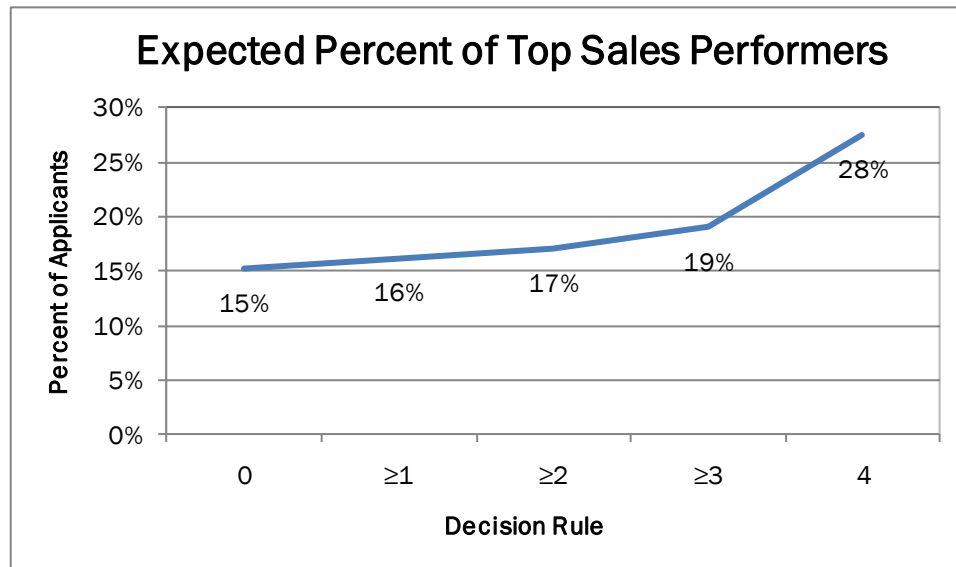
The results in Table 4.3 indicate the HPI scales Ambition and Sociability relate to overall sales ability. Under assumptions of linearity, Interpersonal Sensitivity and Prudence are unrelated to overall sales ability; however, based upon cutoff score odds ratios, when individuals score within a moderate band as opposed to the extremes of the distribution, they are more likely to be better sales performers.

The correlation coefficients are summary statistics including scores across the entire range of personality, incorrect interpretations may occur if assumptions of linearity are not accurate (i.e., curvilinearity; Kahneman & Ghiselli, 1962). An alternative strategy is to determine a set of optimal cutoff scores for distinguishing between levels of performance. Such techniques focus directly on distributions of predictor scores and categorize individuals into “passers” and “failures” (Guttman & Raju, 1965). Cutoff scores based on a combination of judgmental, normative, and performance-based evidence often can attain the goal of providing practical guidelines to organizations for differentiating between qualified and unqualified candidates using personality assessments (Berry & Sackett, 2009; Truxillo, Donahue, & Sulzer, 1996). This process results in an improved alignment between the content of the scales and the performance standards of the job.

First, Hogan relied upon judgmental evaluations from internal experts to identify the initial lower end cutoff scores based upon the bottom fifth percentile of the HPI’s normative distributions. This is a norm-referenced strategy (Cascio, Alexander, & Barrett, 1988). Further, due to potential curvilinearity, upper end cutoff scores were initially set at the 95 percentile for interpersonal sensitivity and prudence. These initial cutoff scores were conservative estimates to support minimal sales proficiency, remove excessively high cases, but retain a sufficient applicant base for meeting hiring requirements. Second, starting with the initial cutoff scores, Hogan underwent an iterative validation process to identify the optimal cutoff scores for maximizing identification of top sales performance. This is an adjusted criterion-referenced strategy (Cascio et al., 1989; Mauer, 2005). This combination of techniques provides validation evidence that individuals meeting or exceeding recommended cutoff scores are more likely to be better performers (Mauer, 2005).

To ensure final cutoff scores screen out lower potential applicants from the applicant pool, Hogan shifted the moderate bands for Interpersonal Sensitivity and Prudence upward (presented in the next section, Table 5.2) and reanalyzed the cutoff scores for identifying top sales performers. Hogan tabulated a 4 x 5 contingency table with rows representing sales ability performance levels (Bottom 16%, Moderately Low 17%-50%, Moderately High 51%-84%, Top 16%) and columns representing number of cutoff scores used (zero, one, two, three, or all four). A significant association was found (Spearman Rho = .09, $p < .01$), indicating that passing more success ranges for cutoff scores is associated with higher sales performance (see Figure 4.1). The graph shows a greater proportion of top sales performers in the group meeting all cutoff scores as compared to the group meeting none of the cutoff scores. In other words, the use of more stringent requirements increases the expected number of sales men and women who will be top sales performers.

Figure 4.1 Percentage of Top Sales Performers as a Function of Success Ranges ($N = 847$)



5 – RECOMMENDATIONS

Prior sections of this document describe the validation procedures employed to confirm the HPI's ability to predict performance as defined in terms of dimensions related to effective performance of sales jobs. Meta-analytic methods evaluated the validity of personality measures for predicting job performance. Pooled criterion-related evidence for top sales performance confirmed the validity of personality for prediction and further refined the profile to identify top sales performers.

Table 5.1 summarizes (a) the results of the validity generalization and sales criterion research and (b) the type of support received by each scale under each method. An expert review of these combined results as well as other qualitative information allows Hogan experts to determine the most appropriate scales used as a foundation for screening candidates into sales jobs.

Table 5.1 Summary of Validation Results

Scale	Meta-Analysis	Criterion Validity
Adjustment	XX	
Ambition	XX	XX
Sociability	XX	X
Interpersonal Sensitivity	X	X
Prudence	X	X
Inquisitive		
Learning Approach	X	

Combinations of personality variables are more predictive of many work-related outcomes than are single personality scales (Ones, Dilchert, Viswesvaran, & Judge, 2007; Tett & Christiansen, 2007). Consistent with this idea, personality profiles combine multiple personality scales to maximize the prediction of job performance. Based on the job family meta-analysis and pooled criterion validity, Hogan recommends sales organizations use the HPI Ambition, Sociability, Interpersonal Sensitivity, and Prudence scales as a first-level screen for candidates applying for sales jobs.

5.1 Recommended Cutoff Scores. On each scale for which validity evidence was established, Hogan recommends a set of sales potential cutoff scores; these guidelines will screen in strong candidates possessing attributes deemed most critical to effective performance in sales jobs and exclude individuals possessing excessive amounts resulting in disruptive tendencies. In order to identify the top performers, more stringent requirements on the scales are recommended; however, competing factors such as number of applicants, openings, potential adverse impact, and practicality should be combined with local standards to determine the number of successful ranges

below which applicants are rejected. The Sales BASIS provides one source of information for distinguishing between applicants who otherwise meet minimal requirements on both personality and other selection instruments; thus it is a tool for distinguishing between multiple qualified candidates. The cutoff scores shown in Table 5.2 will help sales organizations identify candidates who are driven, goal-oriented, and energetic (Ambition), outgoing and enjoy customer engagements (Sociability), are perceptive but also not over accommodating (Interpersonal Sensitivity), and are dependable but not inflexible (Prudence).

Note that the recommendations shown in Table 5.2 reflect guidelines only and should be used in conjunction with other available relevant information to screen otherwise qualified candidates.

Table 5.2 Recommended HPI Cutoff Scores

Scale	Low Fit	Moderate Fit I	Moderate Fit II	Moderate Fit III	High Fit
HPI Ambition		≥ 50%	≥ 50%	≥ 50%	≥ 50%
HPI Sociability	Fails to	≥ 70%	≥ 70%	≥ 70%	≥ 70%
HPI Interpersonal Sensitivity	Meet “Moderate Fit” Cutoff	≥ 20% & ≤ 80%	≥ 20% & ≤ 80%	≥ 20% & ≤ 80%	≥ 20% & ≤ 80%
HPI Prudence	Scores	≥ 25% & ≤ 95%	≥ 25% & ≤ 95%	≥ 25% & ≤ 95%	≥ 25% & ≤ 95%

Note. Candidates achieving a “Moderate I” level of fit are required to pass any combination of 1 of the 4 scales. Candidates achieving a “Moderate II” level of fit are required to pass any combination of 2 of the 4 scales. Candidates achieving a “Moderate III” level of fit are required to pass any combination of 3 of the 4 scales. Candidates achieving a “High” level of fit are required to pass any combination of 4 of the 4 scales.

5.2 Adverse Impact. An examination of Adverse Impact (AI) is critical for companies that use professionally developed selection instruments to make personnel decisions. In such a system, companies use selection results to determine which applicants will advance to later stages in the selection process.

To examine AI, Hogan used the 4/5ths rule, as outlined in the *Uniform Guidelines on Employee Selection Procedures* (Equal Employment Opportunity Commission, 1978; hereafter “*Guidelines*”). The *Guidelines* state:

A selection rate for any race, sex, or ethnic group which is less than 4/5ths (4/5, or 80%) of the rate for the group with the highest rate will generally be regarded by Federal enforcement agencies as evidence of adverse impact... (Section 4D, p.38297).

Since 1978, the 4/5ths rule is the acceptable guideline in the U.S. for examining AI based on group selection rate differences (e.g., Bobko, Roth, & Potosky, 1999; Reilly & Chao, 1982; Reilly & Warech, 1993; Schmitt, Rogers,

Chan, Sheppard, & Jennings, 1997). Some researchers are critical of the 4/5ths rule, arguing instead for significance testing (Morris & Lobsenz, 2000; Roth, Bobko, & Switzer, 2006; Shoben, 1978). However, a review of the *Guidelines* by Cascio and Aguinis (2001) outlined the controversies of significance testing. They state:

The controversies surrounding significance testing seem to be due mainly to how significance testing is used. Stated differently, many researchers have noted that significance testing is abused and misused (e.g., Cohen, 1994; Schmidt, 1996). Significance testing allows us to infer whether the null hypothesis that selection rates are equal in the population is likely to be false. On the other hand, significance testing is incorrectly used when: (a) conclusions are made regarding the magnitude of selection rate differences across subgroups (e.g., a statistically significant result at the .01 level is interpreted as a larger difference than a result at the .05 level) and (b) failure to reject the null hypothesis is interpreted as evidence of lack of differences in selection rates in the population (i.e., not detecting differences in the sample may be due to insufficient statistical power). (p. 204)

Cascio and Aguinis (2001) continue by stating that, since the *Guidelines'* inception in 1978, the Equal Employment Opportunity Commission (EEOC) has provided no supplemental information regarding appropriate statistical power, methodology, or significance testing levels for determining AI. Although some researchers argue for the use of significance tests to examine AI, the appropriate use of such analyses remains undefined by the EEOC. As a result, Hogan continues to use the EEOC's recommendation of the 4/5ths rule.

Calculations using the 4/5ths rule produce a ratio where (a) numbers greater than 1.00 indicate that results for minority group applicants fall within acceptable ranges more frequently than results for the majority group and (b) ratios below 1.00 indicate that results for minority group applicants fall within acceptable ranges less frequently than results for the majority group. According to the 4/5ths rule, evidence of AI exists when this ratio is less than .80.

Hogan evaluated potential selection rates for gender, age, and race/ethnicity groups using a Sales HPI archival sample of applicants who provided demographic characteristics ($N = 17,150$). For these analyses, we compared individuals who passed at least two or more of the screening guidelines to those who passed one or less. The results of these analyses serve only as estimates of potential selection rates using a minimal number of cutoff scores in lieu of actual applicant data from the organization's sales department. A number of non-test factors, most notably the opportunity to take the assessment, affect selection rates. Table 5.3 shows the selection rates based on data from the Sales HPI archival sample by demographic group, where

males, White applicants, and applicants under 40 years of age are considered the majority groups. Based on the 80% rule-of-thumb, these findings suggest using at least two of the recommended cutoff scores should not result in adverse impact against any minority group.

Table 5.3 Effects of Applying Two or More Recommended HPI Cutoff Scores to the Hogan Archival Sales Sample—Selection Rates and Adverse Impact Ratios by Demographic Group

		Fail	%	Pass	%	A.I. ratio
Total		1886	11.0%	15264	89.0%	NA
Gender	Men	859	9.6%	8107	90.4%	NA
	Women	604	11.0%	4891	89.0%	0.98
Age	< 40	702	8.7%	7363	91.3%	NA
	≥ 40	291	16.3%	1497	83.7%	0.92
Race/	Black	102	11.4%	790	88.6%	0.98
Ethnicity	Hispanic	105	12.7%	723	87.3%	0.97
	Asian American/P.I.	22	6.9%	297	93.1%	1.03
	American Indian/A.N.	11	15.7%	59	84.3%	0.93
	White	1008	9.6%	9472	90.4%	NA

Note. P.I. = Pacific Islander; A.N. = Alaskan Native; NA = Not Applicable.

5.3 Uses and Applications. There is no indication that selection using the HPI will result in adverse impact against any group. Therefore, because this assessment is valid and does not discriminate unfairly, Hogan recommends that sales organizations administer the HPI to sales applicants and score the assessments using the recommended scales and at least two cutoff scores shown in Table 5.2. Employment suitability should be determined, in part, by assessing scores on the recommended HPI scales.

The following procedures will help sales organizations use and monitor the selection process. First, the applicant flow should be examined closely to determine if the recommended cutoff scores allow enough applicants to pass while screening out applicants who are likely to be poor performers. Cutoff scores on which everyone fails are just as ineffective as those on which everyone passes. Second, sales organizations should maintain records of test scores by demographic group, as indicated in the *Uniform Guidelines*, to monitor the possibility of adverse impact resulting from the use of the HPI. Third, the appropriate administrative personnel at the sales organization 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 one year but not more than five years. Test validation experts recommend that the results obtained in a validation study should be reviewed and updated after five years (Schmit, Lundquest, & Beckham, 2008). Finally, performance appraisal and/or monitoring data should be

maintained, if possible, on new incumbents 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. 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 or the results provided, please contact:

Hogan Assessment Systems
P.O. Box 521176
Tulsa, Oklahoma 74152
(918) 749-0632

5.4 Accuracy and Completeness. 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.

Hogan attests to the accuracy of the data collection, analysis, and reporting procedures used in this validity study. For validity generalization, 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 sales performance. Hogan then 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 criterion validity proceeded from an analysis of sales studies of the Hogan archive. Hogan searched the archive for studies including the sales ability dimension and, once identified, Hogan pooled this information into a single SPSS/V.12.0 statistical software database. Hogan then computed the validity coefficients shown in this report.

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