Introduction to the HBDI® and the Whole Brain® Model

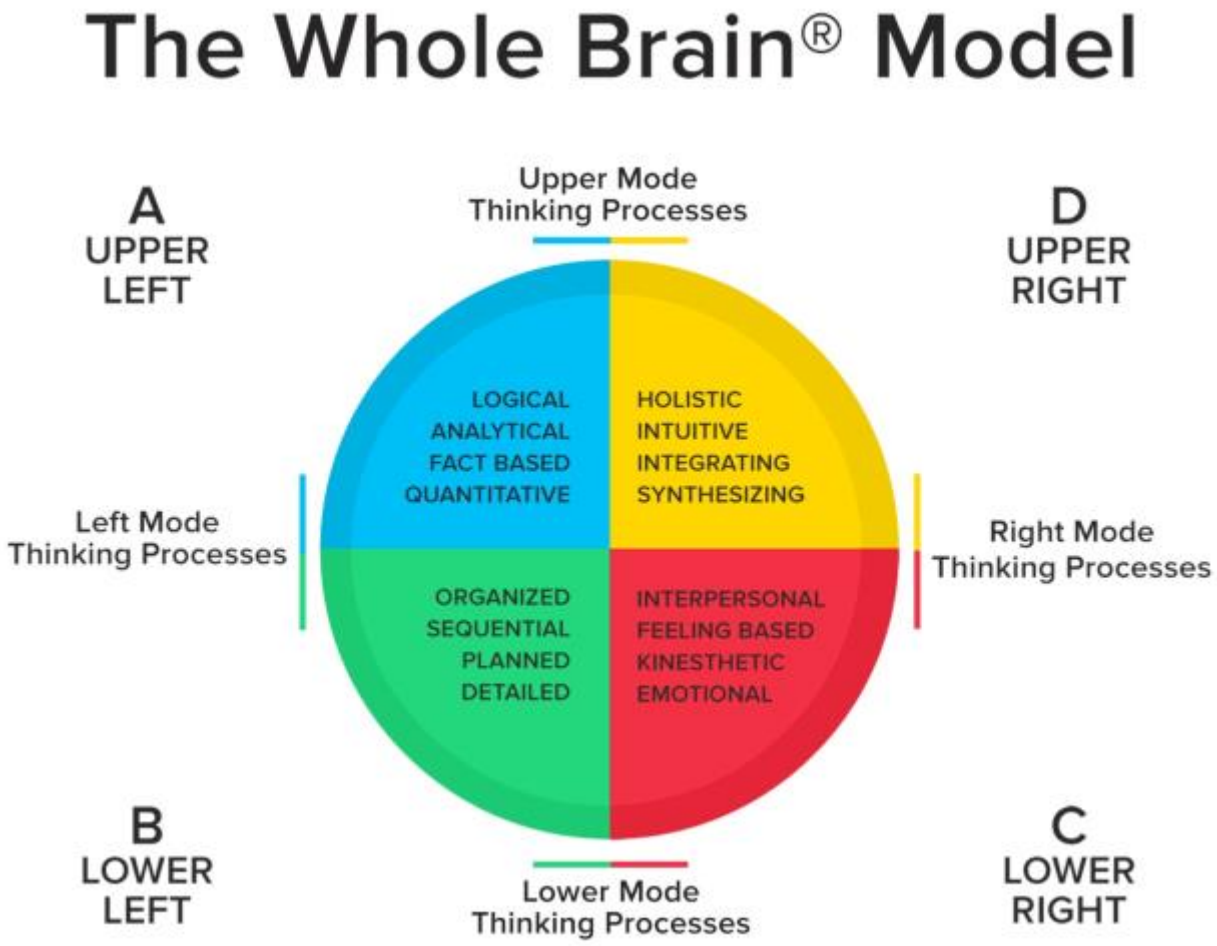
Technical Overview & Validity Evidence

UPDATED 2016

Herrmann

OVERVIEW

The theory on which the Whole Brain® Model and the Herrmann Brain Dominance Instrument® (HBDI®) were built has been supported with reliability and validity evidence from over 30 years of research on a global database comprised of over a million individuals. Ned Herrmann, the originator of the Whole Brain® Model, sought to apply brain-based research to the field of business and developed the Whole Brain® Model accordingly (e.g., Herrmann, 1981, 1982, 1991, 1996). The model is based on the neuroscientific premise that the brain works in systems, and it elucidates four integrated systems that, based on theoretical rationale and empirical evidence (e.g., Bunderson, Newby, Olsen, & Wendt, n.d.; Bunderson, Olsen, & Herrmann, 1982; Ho, 1988), help explain personal and professional success. Everyone has access to all four systems, but over time we develop individualized preferences. The Whole Brain® Model helps people better understand the four integrated systems, better understand their preferences for each of the systems, and ultimately gives individuals, teams, and organizations the capacity to increase thinking agility to maximize performance.



WHAT IS THE HBDI®?

The HBDI® was developed to measure human mental preferences described by the Whole Brain® Model. Specifically, the instrument was developed to measure the four integrated systems that effectively describe clusters of individualized preferences. The HBDI® is grounded in theory and has support for its validity through both rational and empirical evidence. Past research has shown the HBDI® measures validly the four integrated systems of mental preferences (e.g., Ho, 1988; Bunderson et al., 1982). Further, past research has demonstrated that scores from the HBDI® can be used validly to predict and inform thinking preferences, performance, and results.

WHAT DOES THE HBDI® MEASURE?

The HBDI® measures four integrated systems of thinking preferences that help explain personal and professional success. Each system is a cluster of interrelated mental activities and thinking preferences. These four systems can be mapped metaphorically on the human brain as the Upper Left (A Quadrant), Lower Left (B Quadrant), Lower Right (C Quadrant), and Upper Right (D Quadrant). The A Quadrant is typified by preferences that are logical, analytical, technical, and quantitative. The B Quadrant is typified by preferences that are controlled, planned, administrative, and sequential. The C Quadrant is typified by preferences that are emotional, interpersonal, feeling oriented, and spiritual. The D Quadrant is typified by preferences that are imaginative, holistic, innovative, and synthesizing. These quadrants are the four key interrelated constructs measured by the HBDI®.

It is important to note that the HBDI® does not claim to measure ability, aptitude, or capabilities. Further, the HBDI® does not claim to measure activity in specific localized areas of the human brain. The brain model is simply a metaphor that helps users poignantly understand the Whole Brain® Model while appreciating the rigorous neuroscientific principles upon which it was founded.

Quadrant Scores. The HBDI® measures reliably and validly the four quadrants. According to the Whole Brain® Model, describing an individual can only be done comprehensively by examining all four interrelated quadrant scores. Thus, each individual receives a 4-quadrant preference profile with a ranking of 1 (primary), 2 (secondary), or 3 (tertiary) for each quadrant based on the degree of preference for the respective quadrant attributes. For example, an individual with a profile of 1232 would have primary preferences for A-Quadrant thinking, secondary preferences for B- and D-Quadrant thinking, and tertiary preferences for C-Quadrant thinking. Individuals also receive raw scores for each quadrant, which provide more detail concerning the degree to which preferences exist for each quadrant. Using the above example (i.e., 1232), the A-Quadrant primary score could hypothetically be 70 or it could be 130—both are considered primary but one is clearly of a greater magnitude.

Left-Brain Cluster versus Right-Brain Cluster Preferences. In addition to quadrant scores, the HBDI® also provides scores associated with preferences for the metaphorical left brain (A and B Quadrants) versus right brain (C and D Quadrants). Individuals with scores denoting strong preference in the left hemisphere tend to be partial to logical, organized, and fact-based mental activities. Conversely, individuals with scores denoting strong preference on the right quadrants tend to have preferences for emotional, intuitive, and innovative mental activities.

Upper Mode versus Lower Mode Dominance. In addition to left brain versus right brain, the HBDI® also provides scores associated with preferences for the metaphorical upper mode (A and D Quadrants) versus lower mode (B and C Quadrants) mental activities. Higher scores in the upper quadrants are indicative of preferences toward logical, technical, innovative, and synthesizing mental activities, whereas higher scores in the lower quadrants are typically indicative of preferences toward emotional, interpersonal, organized, and safekeeping mental activities.

Stress Profile. In addition to preference profiles and raw scores, the HBDI® also provides individuals with stress profiles. The stress profile is an extension of the preference profile, and its scores are used to inform individuals about their typical preference styles when dealing with significant stress. For example, the proclivity to have logical and rational thinking preferences during stressful situations manifests as a higher score on the stress profile for the A Quadrant.

USES OF THE HBDI® AND THE WHOLE BRAIN® THEORY

The Whole Brain® Model has been applied in numerous work and organizational contexts. Its intended use is to help individuals, teams, and organizations recognize and understand thinking preferences and boost thinking agility in order to enable better thinking, better performance, and better results. It helps individuals understand their own thinking preferences and leverage them to facilitate learning and development, problem solving, decision making, communication, productivity, and subjective wellbeing. It helps teams better understand each team member and leverage this information to facilitate communication, team effectiveness, and morale. Finally, it helps organizations leverage information on thinking preferences to increase organizational effectiveness, develop and retain top talent, boost revenue, and facilitate various management and leadership processes. (See Table 1 for a nonexhaustive list of instrument uses that are deemed appropriate based on theoretical and empirical rationale.)

Table 1
Appropriate Uses of the HBDI® and Whole Brain® Model

1. Better understanding of self and others.
2. Enhanced communication and interpersonal effectiveness.
3. Enhanced productivity at the individual, team, and organizational levels.
4. Building a work climate and designing jobs that facilitates creativity and productivity.
5. Developing authenticity and trust.
6. Enhanced teaching effectiveness.
7. Enhanced learning and development.
8. Better management and leadership.
9. Educational and occupational counseling.

At present, validity evidence for the HBDI® has not been collected to approve its use in clinical testing,

diagnostic testing, or medical or psychological classification. There is also an absence of validity evidence for its use in admissions or placement testing prior to educational programs or training events. Lastly, in its current state, the HBDI® is not recommended for personnel selection decisions, professional and occupational licensure, or certification.

EVIDENCE OF RELIABILITY AND VALIDITY

Database Characteristics and Descriptive Statistics

Since inception, Herrmann International has supported an ongoing effort to establish a program of research that supports the validity of the HBDI®. Between the years of 1980 and 2014, Herrmann International's database amassed over 1.4 million records of individuals who had completed the HBDI® around the globe. The HBDI® database records include a diverse array of demographic characteristics. In terms of gender, 603,253 (42.71%) self-identified as female and 809,337 (57.29%) self-identified as male. Participants span all age ranges and come from a diverse array of occupations and job titles (including over 200,000 managers and over 10,000 CEOs). The database includes substantial participation from numerous nationalities (e.g., Australian, French, and Chinese), languages (e.g., English, Spanish, and Italian), and countries (e.g., Canada, Czech Republic, and Finland). In fact, the HBDI® has been translated successfully into over 20 languages. This rich database enables Herrmann International to carry out an extensive and rigorous program of research to contribute to the validity argument and ascertain the psychometric soundness of the HBDI®.

Several descriptive statistics are interesting and worth noting. Displayed in Table 2 are descriptive statistics for each quadrant from a representative sample of the HBDI® global database, including the arithmetic mean (*M*), standard deviation (*SD*), minimum, and maximum. Skewness and kurtosis are also included to demonstrate that the data demonstrate multivariate normality, which is a statistical assumption about data that is often elusive and overlooked. Displayed in Table 3 are the most frequently occurring HBDI® preference profiles. Finally, displayed in Figure 1 is the frequency of quadrant scores for a representative sample of the global database.

Table 2

Descriptive Statistics from a Representative Sample of the HBDI® Database

	All (*N* = 70,621)					
	M	*SD*	Min	Max	Skewness	Kurtosis
A Quadrant	79.38	24.47	12	153	-0.044	-0.597
B Quadrant	77.46	19.06	12	158	0.091	-0.209
C Quadrant	65.75	21.55	11	147	0.299	-0.311
D Quadrant	70.52	22.84	14	182	0.457	-0.127
	Males (*n* = 35,268)					
	M	*SD*	Min	Max	Skewness	Kurtosis
A Quadrant	88.24	22.49	18	153	-0.216	-0.419

B Quadrant	75.47	18.76	12	152	0.118	-0.173
C Quadrant	58.00	19.26	11	138	0.439	-0.059
D Quadrant	69.87	22.24	15	182	0.507	-0.006
	Females (*n* = 35,353)					
	M	*SD*	Min	Max	Skewness	Kurtosis
A Quadrant	70.53	23.13	12	153	0.156	-0.497
B Quadrant	79.45	19.14	17	158	0.056	-0.230
C Quadrant	73.49	20.93	11	147	0.141	-0.319
D Quadrant	71.16	23.40	14	173	0.405	-0.236

Table 3

Top 10 Ranked Preference Profiles from HBDI® Global Database

	All (*N* = 1,374,792)		Males (*n* = 790,183)		Females (*n* = 584,609)	
1	1122	18.95%	1122	23.26%	2111	16.04%
2	2111	10.29%	1221	13.59%	1122	13.12%
3	1221	9.85%	1121	12.14%	2211	12.23%
4	1121	9.19%	2211	6.19%	2112	11.66%
5	2211	8.76%	2111	6.04%	1112	9.78%
6	1112	7.61%	1112	6.00%	1121	5.20%
7	2112	6.63%	1132	4.87%	1221	4.77%
8	1211	4.75%	1211	4.77%	1211	4.73%
9	1132	3.09%	1222	3.31%	1111	3.13%
10	1111	2.98%	2112	2.91%	3111	3.08%

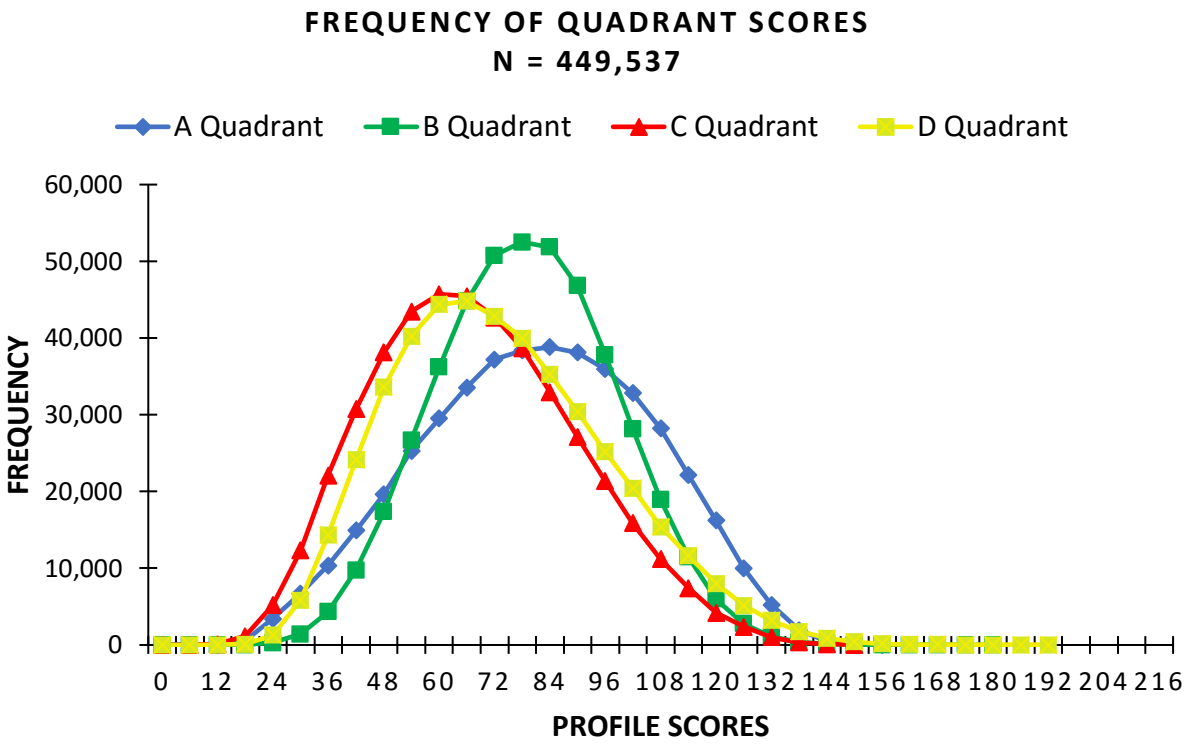


Figure 1. Frequency of quadrant scores.

Reliability Evidence

Test-Retest Reliability. Test-retest reliability is a stability measure that refers to the extent to which a measurement instrument produces consistent scores when the same measurement procedure is used with the same participant using the same instrument on repeated measures over a given period of time. An instrument is said to be unreliable when it is unable to produce consistent scores under these repeated conditions. Using 78 cases in which individuals took the HBDI® on at least two occasions, Ho (1988) found test-retest reliabilities of .96 for left-brain preferences, .96 for right-brain preferences, .86 for A-Quadrant preferences, .98 for B-Quadrant preferences, .94 for C-Quadrant preferences ,.97 for D-Quadrant preferences, .98 for Cerebral preferences, and .91 for Limbic Preferences.

Internal Consistency Reliability. Coefficient alpha (α) is a measure of internal consistency reliability (Cronbach, 1951). Because each of the four quadrants are considered unidimensional constructs, they should demonstrate internal consistency by demonstrating a coefficient $\alpha > .70$ (Nunnally, 1978). Based on a sample size of 181,139, Bunderson and colleagues (n.d.) found sufficient internal consistency reliabilities for the A Quadrant ($\alpha = .84$), B Quadrant ($\alpha = .77$), C Quadrant ($\alpha = .80$), and D Quadrant ($\alpha = .81$). This suggests that items within each construct are internally consistent and manifestations of a single latent dimension.

Validity Evidence

Validity is best thought of as an accumulation of theoretical and empirical evidence. Validity is not an inherent characteristic of a measurement instrument; rather, according to the Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999), "Validity refers to the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests." Validity is of paramount concern for any measuring instrument, and therefore Herrmann International has been relentless in their pursuit of building a sound scientific basis to support the HBDI® and the theoretical model on which it is built.

Face Validity. Face validity refers to the extent to which the instrument and its scores appear to the test taker or respondent to measure what it purports to measure. Evidence of face validity is particularly important for self-report preference instruments like the HBDI® because they are dependent on honesty and forthrightness from the respondents. Further, for respondents to trust the results and accept the information as pertinent and practical, participants have to believe in the integrity of the measurement instrument. Research has not been done to formally collect evidence of face validity, but anecdotal accounts suggest that HBDI® respondents are overwhelmingly positive about their experience with the HBDI® and attest to the perceived accuracy of the reported results.

Content Validity. Evidence of content validity is provided by demonstrating that the content involved in the measurement instrument is representative—and neither contaminated nor deficient—of the constructs that it purports to measure. This evidence is often established by subject matter experts (SMEs) who verify that

items and scales sufficiently tap relevant content domain. The HBDI® and its constituent constructs are well grounded in scientific theory and ongoing rational reviews by multiple SMEs continue to support the representativeness of items within each content domain.

Internal Construct Validity. Internal construct validity (or structural validity) is supported when empirical evidence suggests the number of distinct constructs measured by an instrument align with theory-based predictions and a priori conceptualizations (Cronbach & Meehl, 1955; Messick, 1989). Further, items and manifest indicators of constructs must map onto the construct they are purported to measure. The HBDI® measures four main constructs (i.e., the four quadrants), and each construct has an array of indicators that contribute to the scoring of each construct.

Research to date has provided sound support for the structural validity of the HBDI® (e.g., Bunderson et al., n.d., 1982; Ho, 1988; see also Herrmann, 1988, 1991). Factor analytic results have consistently supported the theoretical dimensionality of the four quadrants. Further, items and manifest indicators have consistently loaded reliably onto their respective quadrants, demonstrating clean factor structures. Finally, results support the interpretation of two bipolar second-order factors (A vs. C and B vs. D) and a single bipolar third-order factor (Left vs. Right Dominance). The former indicates that preference toward one end of the bipolar factor (e.g., A-Quadrant preference or B-Quadrant preference) often coincides with avoidance toward the other end of the bipolar factor (e.g., C-Quadrant avoidance or D-Quadrant avoidance). The latter indicates that dominance toward left-brain preferences often coincides with avoidance toward right-brain preferences. These findings align with Whole Brain® Model predictions and with research in psychological and neuroscientific disciplines.

External Construct Validity. Collecting evidence of external construct validity consists of comparing instrument measures to other external instrument measures in order to examine its network of relations with other measures that should theoretically be similar to (convergent validity) or dissimilar to (discriminant validity) the referent measure (Cronbach & Meehl, 1955; Messick, 1989). The Whole Brain® Model provides theoretical rationale for why the HBDI® should relate with other psychological constructs of interest. The HBDI® is purported to measure thinking preferences that are important determinant of mental activities, behaviors, and experiences, in important life contexts such as home, leisure, and work. Thus, these thinking preferences constructs should relate to an array of actions and decisions that can be observed, measured, and then linked to the HBDI®.

Several factor-analytic investigations into the external validity of the HBDI® have been conducted. The HBDI® and its constructs have been included in large scale factor analyses with external measures of personality, cognitive ability, cognitive styles, and learning strategies such as the Myers Briggs Type Indicator, the Educational Testing Services Kit of Factor Reference Tests (e.g., Necessary Arithmetic Operations, Gestalt Completion, and Hidden Figures), Ravens Progressive Matrices, various individual differences questionnaires (e.g., Hill Individual Difference Questionnaire and Paivio Individual Difference Questionnaire), and various measures of learning strategies. Findings indicate that the four quadrants (as well as the left vs. right score) are linked in a consistent and predictable way with mental processes involved in the construct measures (Bunderson, 1989). These findings provide evidence for the practicality of using HBDI® scores in conjunction with other measures and support the utility of using the HBDI® to account for and predict variability in a wide

array of important real-world measures of mental activities, personality, behaviors, and performance.

CONCLUSION

The Whole Brain® Model and the associated measurement instrument (i.e., the HBDI®) have benefited from a solid theoretical foundation and empirical research conducted using Herrmann International's expansive global database. The construct model and the instrument were both developed on solid theory and research, have demonstrated evidence of test-retest reliability and internal consistency reliability, and have consistently demonstrated evidence of internal and external construct validity. The utility of the Whole Brain® Model and the HBDI® has been supported in numerous work contexts, and the ongoing program of research will continue to ensure that it meets rigorous standards of educational and psychological measurement.

REFERENCES

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

Bunderson, C. V. (1989). The validity of the Herrmann Brain Dominance Instrument®. *Creative Brain. Lake Lure, NC: Brain Books*.

Bunderson, C. V., Newby, V. A., Olsen, J. B., & Wendt, D. C. (n.d.). *Validity of the HBDI four-quadrant and left-right structure: A structural validation study using new millennium database.* Unpublished manuscript.

Bunderson, C. V., Olsen, J. B., & Herrmann, W. E. (1982). A fourfold model of multiple brain dominance and its validation through correlational research. (Scientific and Technical Report #10: prepared for General Electric). Orem, Utah: Wicat Incorporated Learning Design Laboratories.

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

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological test. *Psychological Bulletin. 52,* 281-302.

Herrmann, N. (1981). The creative brain. *Training and Development Journal*, *35*, 10-16.

Herrmann, N. (1982). The creative brain II. *Training and Development Journal*, *6*, 74-86.

Herrmann, N. (1988). *The creative brain*. Lake Lure, NC: Brain Books.

Herrmann, N. (1991). The creative brain*. *The Journal of Creative Behavior*,*25*, 275-295.

Herrmann, N. (1996). *The whole brain business book* (Vol. 334). New York: McGraw-Hill.

Ho, K. T. (1988, December). The dimensionality and occupational discriminating power of the Herrmann Brian Dominance Instrument. *Dissertation Abstracts International*, *49*, 2409.

Messick, S. (1989). *Validity*. In R. Linn (Ed.), Educational Measurement, Vol. III.

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