Boston Biometrics International Validation Study

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Objective:
The purpose of this study is to determine whether Boston Biometrics International ("BBI") is capable of determining character risk solely from an individual performing a series of pre-set, pen-on-paper biometric movements. Specifically, can BBI separate job applicants of low character from those of medium and high character using its proprietary employment screening technology?

Validation Theory:
There are proportionally more "bad apples" – people of low character – in prison than there are in the general population. Thus, the result of a blind test of BBI's ability to rate character -- using a random mix of participants with and without criminal records – should produce a difference between the average character ratings for the two groups, with the criminal group having a substantially lower average rating.

Method:
226 participants provided 2 pages of pre-set, pen-on-paper biometric movements to neutral third parties as part of a job application process. These pen-on-paper samples were faxed directly to the scientific investigator, who then eliminated the participants' names, codified the samples, and removed all other potential identifying marks. The samples were converted to Adobe pdf's, randomly mixed, and emailed to BBI's assessment team for evaluation.

The BBI analysts assigned each sample a character rating from 1 to 99 . . . with 1 to 20 being of extremely low character, 21 to 50 being of low character, 51 to 79 being of medium character, and 80 to 99 being of high character. The scientific investigator organized the ratings by group membership to determine whether the criminal group had a substantially lower average rating than the non-criminal group.

158 of the participants were drawn from the general population.
68 of the participants had a known criminal record.

Results:

The 158 participants with no known criminal record had an average character rating of 56.87 on a scale of 1 to 99, while the 68 participants with a known criminal record had a much lower average character rating of 40.51.

The probability that this distinction is due to chance is less than .001, well below the standard cut off for scientific significance of .05.

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Rating	0	158	56.87	23.217	1.847
	1	68	40.51	23.486	2.848

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Rating	Equal variances assumed	.189	.664	4.840	224	.000	16.352	3.379	9.694	23.011
	Equal variances not assumed			4.817	125.716	.000	16.352	3.395	9.634	23.070

Size of effect: There are a variety of statistics used to determine the size of a statistical effect, as well as its probability.

The Cohen's D effect size is expressed in Standard Deviations. The mean difference between the criminal and non-criminal groups by character rating was 16.35. The standard deviation of ratings was 24.31. The Cohen's D effect size for the group difference was therefore 16.35/24.43 = .67, or two thirds of a standard deviation.

The correlation r effect size = .31.

According to Hemphill (2003)[1], two thirds of published psychological studies would report effect sizes smaller than r = .30.

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[1] Hemphill, J.F. (2003). Interpreting the magnitude of correlation coefficients. *American Psychologist, 58*, 78-80.

Average Character Rating by Group
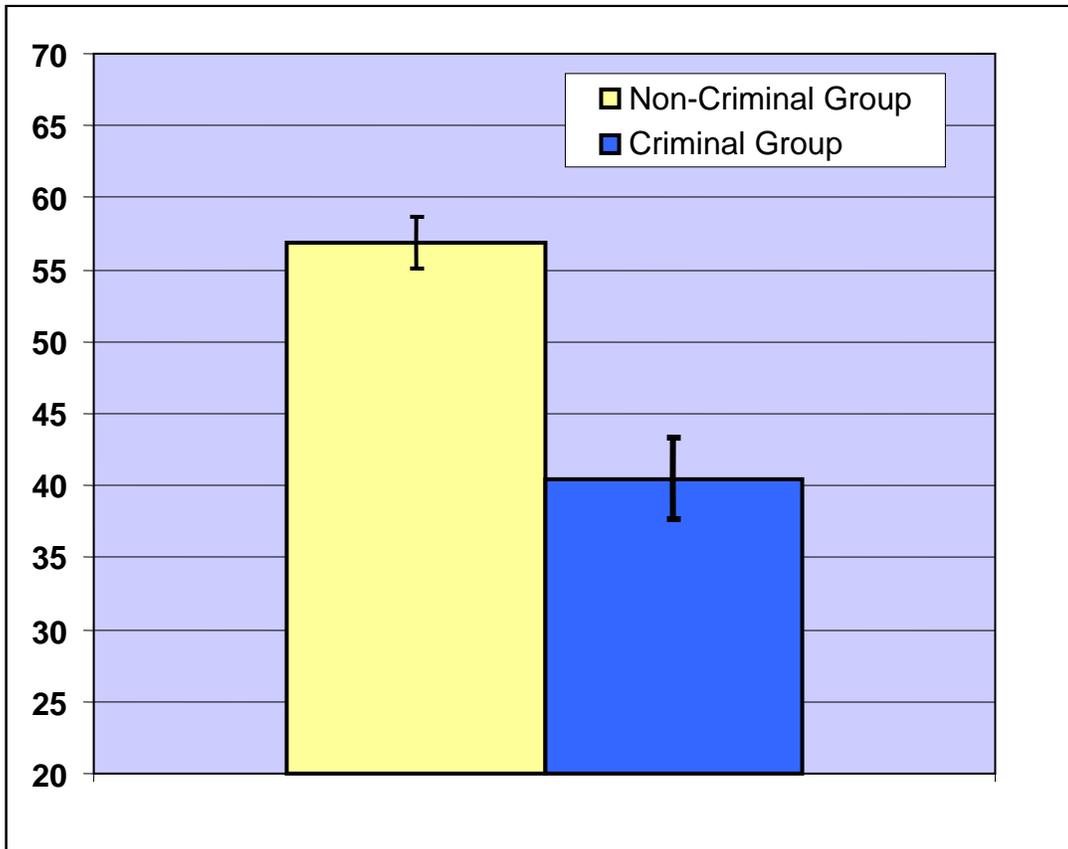
The chart above shows the average character rating for those with a known criminal record vs. those with no known criminal record. Error bars are indicated.

The most typical (median) criminal character rating was 40.

The most typical (median) non-criminal character rating was 60.

CRIMINAL GROUP: Distribution of Character Ratings by Frequency

Mean =40.51
Std. Dev. =23.486
N =68
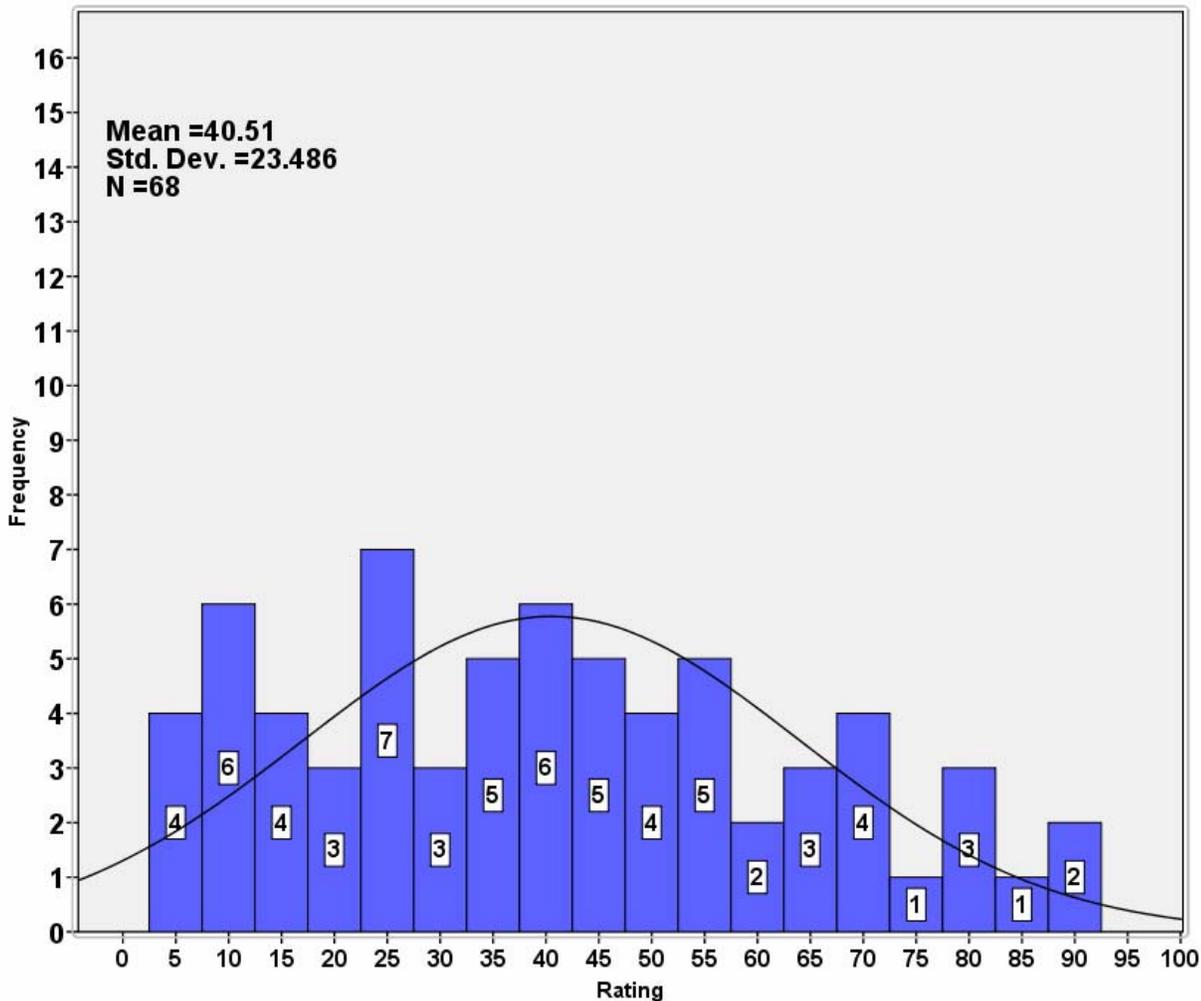
The chart above indicates that 4 individuals with a criminal record were given a character rating of 5, that 6 were given a rating of 10, that 4 were given 15, and so forth. The highest character rating for an individual with a criminal record was 90.
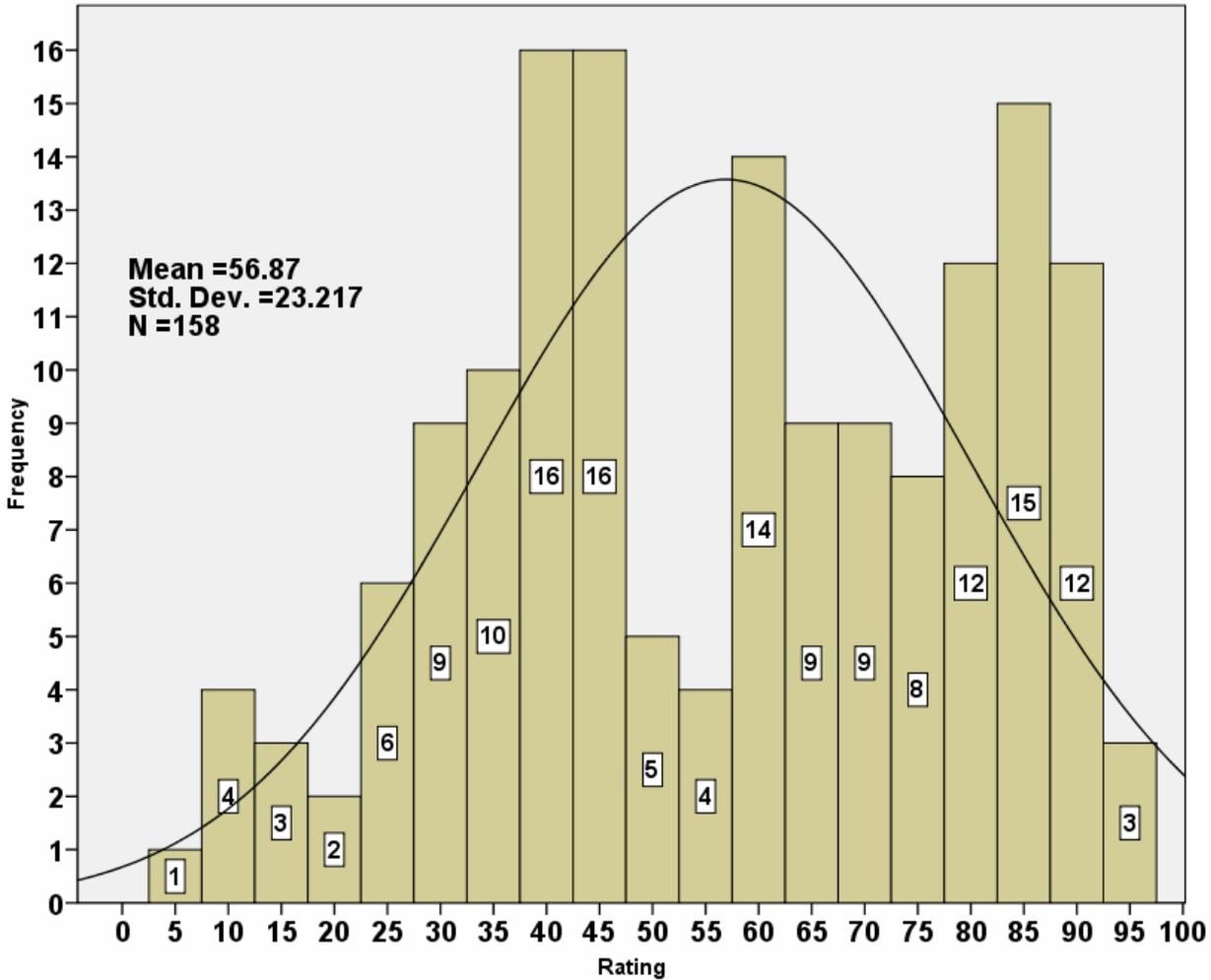
8.8% of the individuals with criminal records (6/68) were rated **80 or more,** which is BBI's range for an individual with **high character.**

22.1% of the individuals with criminal records (15/68) were rated between **51 and 79,** which is BBI's range for an individual with **medium character.**

44.1% of the individuals with criminal records (30/68) were rated between **21 and 50,** which is BBI's range for an individual with **low character.**

25.0% of the individuals with criminal records (17/68) were rated **20 or less,** which is BBI's range for an individual with **extremely low character.**

NON-CRIMINAL GROUP: Distribution of Character Ratings by Frequency

The chart above indicates that 1 individual with no known criminal record was given a character rating of 5, that 4 were given a rating of 10, that 3 were given 15, and so forth. The highest character rating for an individual with a non-criminal record was 95.
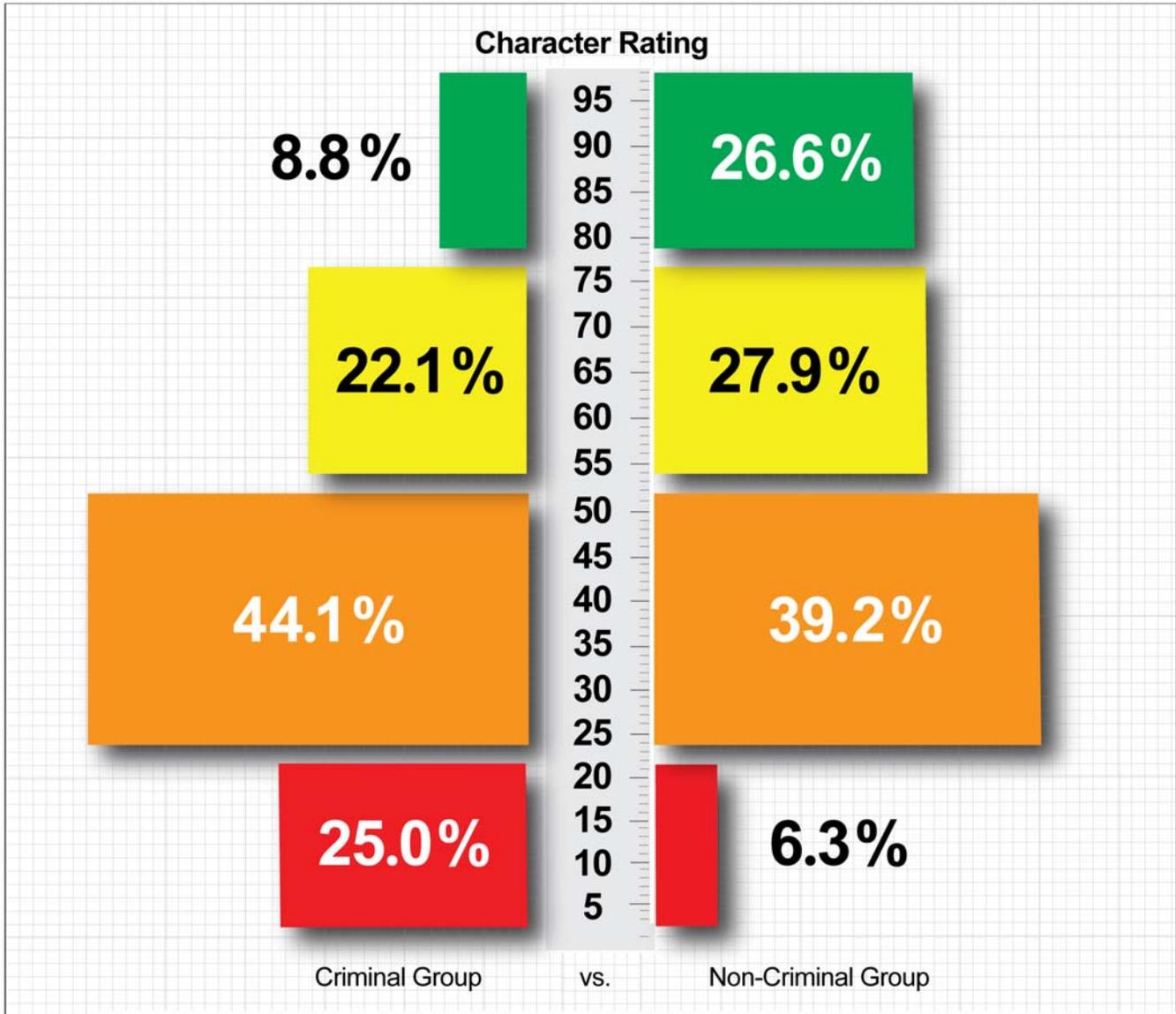
26.6% of the individuals with no known criminal records (42/158) were rated **80 or more,** which is BBI's range for an individual with **high character.**

27.9% of the individuals with no known criminal records (44/158) were rated between **51 and 79,** which is BBI's range for an individual with **medium character.**

39.2% of the individuals with no known criminal records (62/158) were rated between **21 and 50,** which is BBI's range for an individual with **low character.**

6.3% of the individuals with no known criminal records (10/158) were rated **20 or less,** which is BBI's range for an individual with **extremely low character.**

Comparison of Criminal vs. Non-Criminal Groups by Percentage

Character Rating

	Criminal Group	Rating	Non-Criminal Group
Green (80-99)	8.8%	95 / 90 / 85 / 80	26.6%
Yellow (51-79)	22.1%	75 / 70 / 65 / 60 / 55	27.9%
Orange (21-50)	44.1%	50 / 45 / 40 / 35 / 30 / 25	39.2%
Red (1-20)	25.0%	20 / 15 / 10 / 5	6.3%

Criminal Group   vs.   Non-Criminal Group

Legend

- 🟩 80 - 99: High Character
- 🟨 51 - 79: Medium Character
- 🟧 21 - 50: Low Character
- 🟥 1 - 20: Extremely Low Character

CONCLUSION: Boston Biometrics' employment screening technology can separate job candidates of low character from those of medium and high character with a probability of more than 1,000 to 1.