Psychometrical Properties of the Sigma Test

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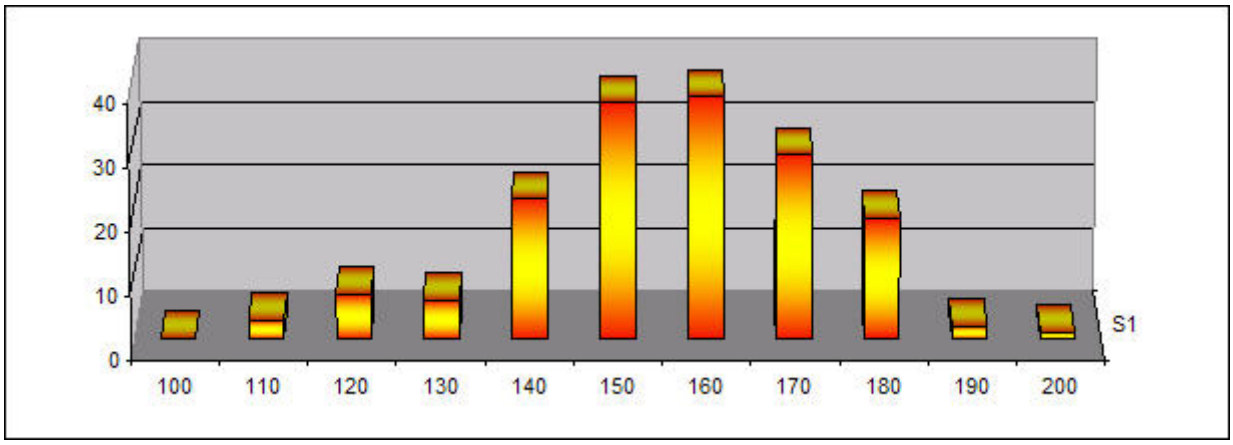
By Hindemburg Melão Jr.
www.sigmasociety.com



Basic Statistics	pQI_G	pQI_5	rIQ_4	rIQ_F	rIQ_D
Mean IQ	**161,5**	**164,1**	**148,6**	**152,8**	**152,8**
Standard-deviation	**17,0**	**17,0**	**15,2**	**13,0**	**13,0**
Median	**163,3**	**166,1**	**152,8**	**154,7**	**154,1**
Kurtosis	**0,547**	**0,130**	**-0,188**	**0,174**	**0,019**
Skewness	**-0,270**	**-0,416**	**-0,725**	**-0,635**	**-0,584**

pIQ_G = Potential IQ Gauged
pIQ_5 = Potential IQ based in non-Gauged norm 2005
rIQ_4 = Rarity IQ based in non-Gauged norm 2004
rIQ_F = Rarity IQ based in Fractional Raw Score (between 0 and 1 for each item)
rIQ_D = Rarity IQ based in Dicotomous Score (0 or 1 for each item)

Robust Estimators for Central Tendency

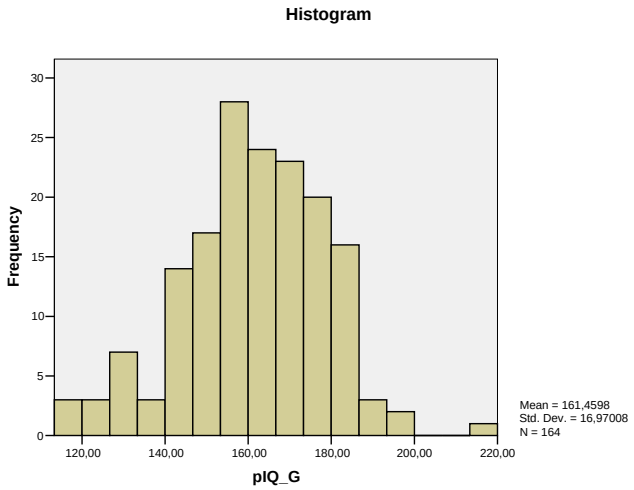
	Huber's M-Estimator(a)	Tukey's Biweight(b)	Hampel's M-Estimator(c)	Andrews' Wave(d)
pIQ_G	162,7028	163,1071	162,5343	163,1277
pIQ_5	165,6412	166,1337	165,4564	166,1580
rIQ_4	151,1802	152,2407	150,5926	152,2690
rIQ_F	154,2802	154,6562	154,0655	154,6712
rIQ_D	154,1611	154,6512	154,0788	154,6703

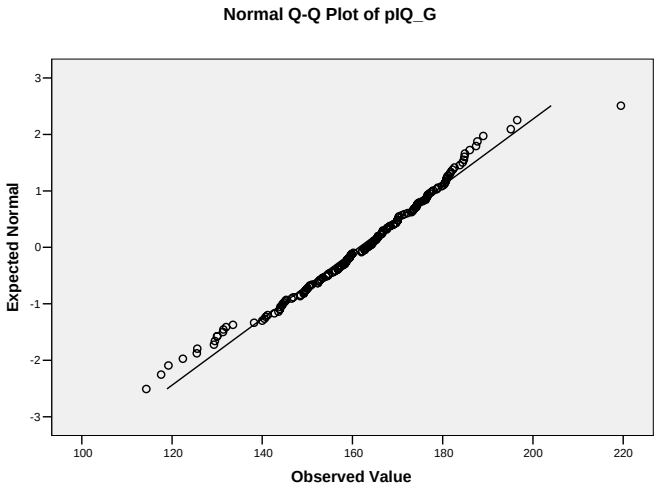
a The weighting constant is 1,339.
b The weighting constant is 4,685.
c The weighting constants are 1,700, 3,400, and 8,500
d The weighting constant is 1,340*pi.

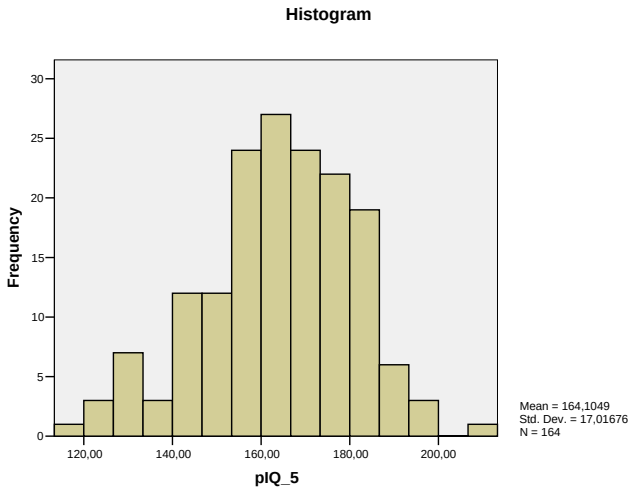
Tests of Normality

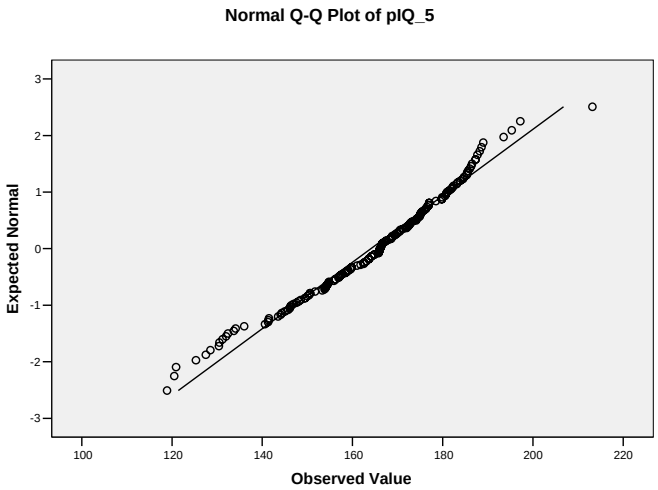
	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
pIQ_G	,054	164	,200(*)	,983	164	,047
pIQ_5	,076	164	,021	,980	164	,020
rIQ_4	,123	164	,000	,939	164	,000
rIQ_F	,094	164	,001	,968	164	,001
rIQ_D	,104	164	,000	,968	164	,001

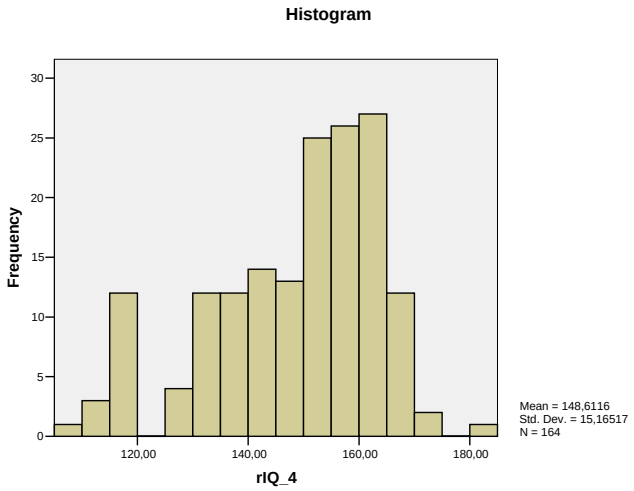
* This is a lower bound of the true significance.
a Lilliefors Significance Correction

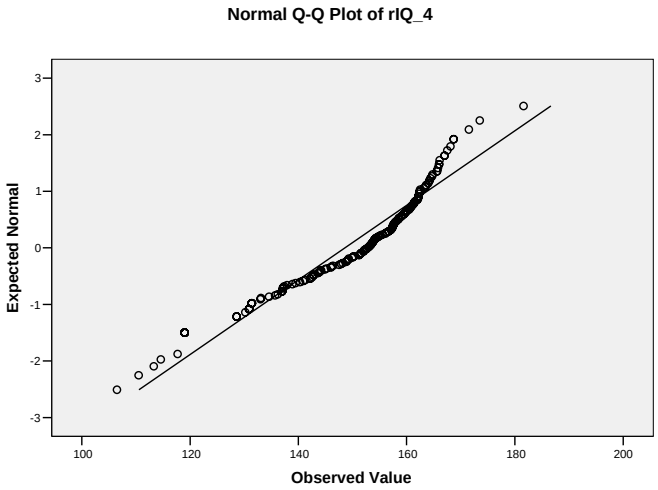

Histogram
Frequency
pIQ_G
Mean = 161,4598
Std. Dev. = 16,97008
N = 164

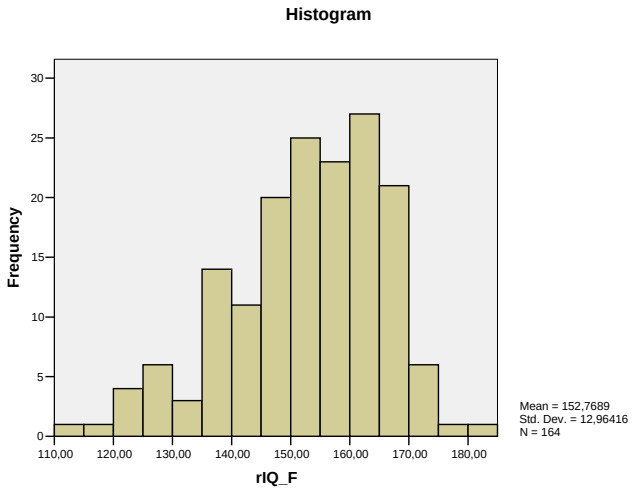

Normal Q-Q Plot of pIQ_G
Expected Normal
Observed Value

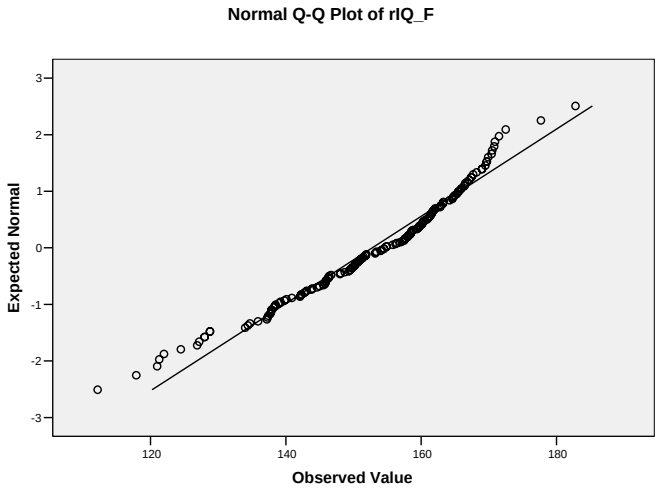

Histogram
Frequency
pIQ_5
Mean = 164,1049
Std. Dev. = 17,01676
N = 164

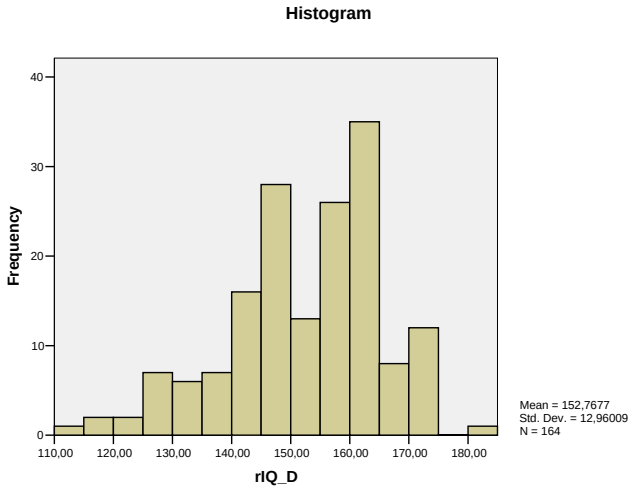

Normal Q-Q Plot of pIQ_5
Expected Normal
Observed Value

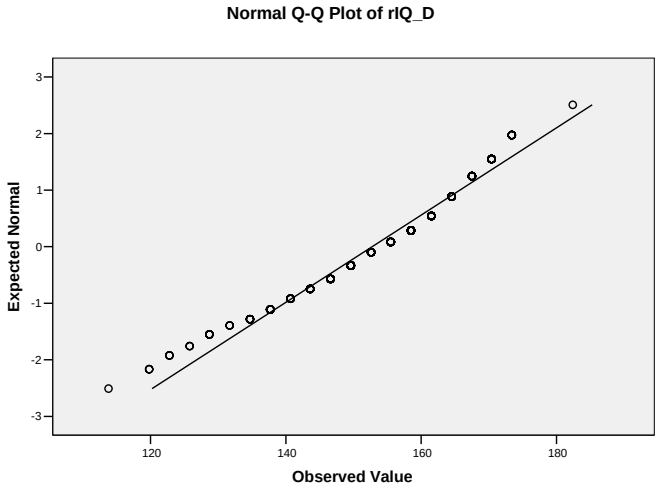

Histogram
Frequency
rIQ_4
Mean = 148,6116
Std. Dev. = 15,16517
N = 164


Normal Q-Q Plot of rIQ_4
Expected Normal
Observed Value









Kolmogorov-Smirnov Test with Monte Carlo adjustment			pIQ_G	pIQ_5	rIQ_4	rIQ_F	rIQ_D
N			164	164	164	164	164
Normal Parameters(a,b)	Mean		161,46	164,10	148,61	152,77	152,77
	Std. Deviation		16,97	17,02	15,17	12,96	12,96
Most Extreme Differences	Absolute		,054	,076	,123	,094	,104
	Positive		,041	,047	,074	,057	,055
	Negative		-,054	-,076	-,123	-,094	-,104
Kolmogorov-Smirnov Z			,685	,977	1,571	1,199	1,329
Asymp. Sig. (2-tailed)			,735	,296	,014	,113	,058
Monte Carlo Sig. (2-tailed)	Sig.		,720(c)	,283(c)	,011(c)	,105(c)	,054(c)
	99% Confidence Interval	Lower Bound	,708	,271	,008	,097	,048
		Upper Bound	,731	,294	,013	,113	,060

a Test distribution is Normal.
b Calculated from data.
c Based on 10.000 sampled tables with starting seed 2.000.000.

Tests of Normality for the Potential IQ Gauged (pIQ_G)

Jarque-Bera

JB – observed value:	3,67
JB - critical value:	4,61
GDL:	2,00
P-value unilateral:	0,16
Alpha:	0,10

Anderson-Darling

A^2:	0,74
P-value unilateral:	0,51
Alpha:	0,10

Lilliefors

D:	0,06
D standardized:	0,69
P-value:	0,28
Alpha:	0,10

Homogeneity coefficients of items

Coeficiente	Raw_D	Raw_F	Ln(Bal)
Kuder-Richardson 20	0,828	0,844	0,468
Split-Half	0,720	0,782	0,742
Correção de Spearman-Brown	0,838	0,878	0,852
Kuder-Richardson 21	0,546	0,594	-
Alfa Estratificado de Cronbach	0,828	0,844	-
Rulon	0,853	0,866	0,859
Guttnan-Flanagan	0,853	0,866	0,859

Raw_D = Dictomous Raw Score
Raw_F = Fractional Raw Score
Ln(Bal) = Naperian Logo of Balanced Score

Short Glossary:

Robust Estimators for Central Tendency are similar to the mean and median, but those are less sensitive at distortion caused by outliers, for that these estimators are “truer” than mean, median or mode. Most exact estimators are Tukey's Biweight and Andrew’s Wave. See more on this subject in our article “Estatística Robusta aplicada no Mercado Financeiro”.

Tests of Normality compare the empirical distribution with a mesocurtic and symmetrical Gaussian. Therefore it is a test of adherence to verify if the hypothesis "the empirical distribution is normal" can be adopted. There are basically two types of tests: the ones that use Chi-square and the ones that are more sensitive at the form. Jarque-Bera and Shapiro-Wilk use Chi-square, while Kolmogorov-Smirnov and Anderson-Darling are more sensitive to the form and therefore more appropriate. See more on this subject in our article “Norma do TIG-NV”.

Monte Carlo with Markov Chain is a very useful recurrence method to improve the accuracy in numeric calculations (estimate maximum likelihood). It is frequently used by MIT, NASA, greatest banks etc., in Quantum Chromodynamic (QCD), in risk management, in nuclear armaments, in Sigma Test norm (of course ☺) and other several areas that demand the maximum accuracy.

Homogeneity coefficients of items, as the name suggests, they indicate the homogeneity of the items that constitute a test. It is important that the items are sufficiently varied, to check different cognitive abilities, and at the same time it is important that they are sufficiently similar to measure the same group of abilities. If the homogeneity is very high, that indicates that the variety is very small and it is bad. If the homogeneity is very low, that indicates that the items are not measuring the same group of characteristics and it is also bad. Coefficients Cronbach's Alpha between 0,6 and 0,9 they indicate good homogeneity.

See also our Factor Hierarchical Analysis on the Sigma Test:
http://www.sigmasociety.com/artigos/afh_st.pdf