

**Interpretation of SB5/Early SB5 Factor Index Scores:
Contrasting Each Factor Index Score with the Mean of an
Individual's Profile of Factor Index Scores**

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Summary: This brief technical note for the SB5/Early SB5 provides a means to contrast each of an examinee's factor index scores with the mean of the factor index scores. This information extends interpretive information already provided in the technical documentation for the SB5/Early SB5.

One approach to evaluating the cognitive strengths and weaknesses in an individual is to examine the profile of five factor index scores available through the *Stanford-Binet Intelligence Scales, Fifth Edition* (SB5) (Roid, 2003a) and the *Stanford-Binet Intelligence Scales for Early Childhood, Fifth Edition* (Early SB5) (Roid, 2004). The scores represent the individual's ability in fluid reasoning, knowledge, quantitative reasoning, visual-spatial processing, and working memory. Many systems of interpreting intelligence test batteries (e.g., Kaufman & Lichtenberger, 1999; Roid, 2003a; Sattler, 2001) employ the method of contrasting each score with the mean of a set of profile scores. For example, in the Technical Manual for the SB5 (Roid, 2003b), tables are presented for contrasting each subtest score with the mean of all 10 subtests (or, all 5 verbal or all 5 nonverbal subtests; see Appendix Table B.3 in Roid, 2003b). This method was originally suggested by Davis (1959) and refined by Silverstein (1982), and is widely used in the interpretation of both the Wechsler scales (e.g., Harcourt Assessment, 2003) and other cognitive batteries.

Two types of statistics are typically used to evaluate the importance of factor-score profile differences using the profile-mean method: statistical significance of the difference and frequency of the difference in the normative sample. The formula for statistical significance was developed by Davis (1959) and employs the standard errors of measurement of each of the scores. As was shown in the Technical Manual (Roid, 2003b; p. 122), the formula (see Formula 1) corrects for the multiple comparisons among all the factor index scores by including the number of scores (K , which is equal to 5 in this case) and a correction to the normal curve significance value.

$$\text{Minimum significant difference} = Z \sqrt{\frac{SEM_T^2}{K^2} + \frac{(K-2)SEM_i^2}{K}} \quad (1)$$

The Z in Formula 1 is the normal curve value for .05, the typical level of significance used in test interpretation and research. However, to provide the correction for multiple comparisons on the same person (called the “Bonferroni correction”), the Z value is divided by the number of scores, 5 in this case. Thus, instead of the usual normal curve value of 1.96 for .05, the .05 is divided by 5 and the resulting .01 gives a normal curve value of 2.58 used in the SB5 analysis. SEM_T^2 is the sum of all the squared standard errors of measurement for all 5 factor scores, and SEM_i^2 is the squared SEM for each factor index score.

The frequencies of differences in the normative sample are calculated in the expected way. The five factor index scores for each person in the sample are averaged, and this mean score is subtracted from each of the 5 factor index scores in turn. The frequency distributions of each of the 5 differences are tabulated and important percentile points in each distribution are identified. Because differences can be either negative or positive, the absolute value of the differences is employed.

To provide a more refined analysis, two studies of factor-score differences were completed: one for preschool children, ages 2 to 5, and one for the remainder of the normative sample. The rationale for this division was that young children have emerging cognitive abilities that often show characteristics different from older children and adults. Also, specific tables for preschool children can be used with the Early SB5. Table 1, for ages 2 to 5, shows the minimum significant differences between each SB5 factor index score and the average score of the 5 factor index scores in the individual’s profile, along with the frequency of the differences in the normative sample. Table 2, for ages 6 and above, shows the same minimum significant differences and percentiles of the frequency distributions of differences.

The typical “rule of thumb” for interpretation is to use the 15th percentile as the point of clinical significance for the frequency of a difference in a normative population. Thus, when interpreting differences between the factor index scores and their profile mean for an individual, use the higher number (either the statistical significance or the 15th percentile frequency) to identify the important differences. For example, for a 10 year-old child, if you found a difference of 10.5, it would not exceed the frequency value (11.2 at the 15th percentile), and thus be statistically significant but not rare enough in the normative sample to be considered clinically important for interpretation.

Users of the SB5 and Early SB5 may use the information derived from this method to identify an examinee’s relative strengths and weaknesses in abilities. Such information may be used to refine practical recommendations from ability assessment, such as implications for preferred methods of classroom instruction.

References

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Table 1. Differences Between SB5 Single Factor Index Scores and the Average Score of the Factor Index Scores in an Examinee's Profile: Statistical Significant Differences and Differences Obtained by Various Percentages of the Standardization Population; Ages 2 to 5 years.

Average of 5 Factor Index Scores	Significance Level	Differences Obtained by Various Percentage of the Standardization Population					
		1%	2%	5%	10%	15%	25%
Fluid Reasoning (FR)	9.0	29.3	24.1	20.0	16.2	14.4	11.6
Knowledge (KN)	8.8	26.8	23.7	18.9	16.0	13.6	10.8
Quantitative Reasoning (QR)	9.5	26.2	22.5	19.2	15.4	13.3	10.2
Visual-Spatial Processing (VS)	10.0	24.5	21.7	18.5	14.4	12.4	9.4
Working Memory (WM)	9.2	21.0	19.6	16.2	13.4	12.0	9.0

Table 2. Differences Between SB5 Single Factor Index Scores and the Average Score of the Factor Index Scores in an Examinee's Profile: Statistical Significant Differences and Differences Obtained by Various Percentages of the Standardization Population; Ages 6 to 85 years.

Average of 5 Factor Index Scores	Significance Level	Differences Obtained by Various Percentage of the Standardization Population					
		1%	2%	5%	10%	15%	25%
Fluid Reasoning (FR)	10.2	20.0	18.2	15.2	12.6	11.2	8.6
Knowledge (KN)	8.8	19.6	17.2	14.4	12.2	10.6	8.6
Quantitative Reasoning (QR)	9.5	17.8	15.9	13.2	11.0	9.6	7.6
Visual-Spatial Processing (VS)	10.0	19.2	17.4	14.0	11.4	9.8	7.6
Working Memory (WM)	9.2	21.2	18.6	15.4	12.8	11.0	8.8