

Negative Behaviors of Boys When Interacting with Their Fathers'

Standard Scores

Statistical Guide: A standard score (also known as a z-score) tells us how many standard deviation units a person is from the mean of some reference group. For example, a person who has a standard score of 1.5 is one and one-half standard deviations above the mean of a group with which he or she is being compared. A person who has a standard score of -2.0 is two standard deviations below the mean of the group.

We can transform standard scores to a new scale by multiplying each standard score by a constant and then adding another constant to the product. Commonly used constants are 10 and 50. For a person with a standard score of 1.5, his or her transformed standard score is $1.5 \times 10 = 15 + 50 = 65$. Standard scores that are obtained by using the constants of 10 and 50 are called McCall's T scores.

A set of standard scores has 0.00 as its mean and 1.00 as its standard deviation. A set of transformed standard scores has the constant that you added as its mean and the constant that you multiplied by as its standard deviation.

Background Notes: Fifty-one pairs of fathers and sons were observed for 10 minutes as they discussed communication problems, spending time together, and school performance. The number of negative behaviors exhibited by each son was recorded. Examples of negative statements made by sons were "You disgust me" and "You spend too much money on stupid things."

The sons' mean age was 12.8 (SD = 0.6) and the fathers' mean age was 43.0 (SD = 4.1). All were middle-class and upper-class Caucasians.

Making a Prediction: Before examining the data below, predict the results you will obtain. (When scientists make predictions, they are hypothesizing). Note that your prediction is not right or wrong. Rather, it represents your best guess as to the outcome you will obtain. After you perform the calculations, you will be able to determine whether the data support your prediction.

1. Predict the number of negative behaviors that corresponds to a z-score of 0.00.
 - A. 12 or more (more than about 1 per minute, on average).
 - B. About 9 to 11 (about 1 per minute, on average).
 - C. 8 or less (less than about 1 per minute, on average).

Data: Table 1 shows the numbers of negative behaviors exhibited by the 51 boys. Before calculating the standard scores and transformed standard scores, you will need to calculate the means and standard deviations of the scores. (Use the formula for estimating the population value of the standard deviation from a sample.) To assist you in doing this, the sum of the scores and the sum of the squared scores are shown immediately below the table.

Table 1 *Raw scores (number of negative behaviors for each boy)*

9	20	9	6	19	3
23	0	8	7	9	4
1	11	13	6	13	10
5	16	15	24	8	14
2	5	14	3	27	10
7	1	5	10	19	15
4	16	13	25	0	4
17	16	3	8	2	11
12	9	1			

$$\sum X = 512$$

$$\sum X^2 = 7,520$$

Calculations:

2. To two decimal places, what is the value of the mean raw score?
3. To two decimal places, what is the value of the estimated population standard deviation?
4. To two decimal places, what is the standard score for a person with a raw score of 12?
5. Rounded to a whole number, what is the McCall's T score for a person with a raw score of 12?
6. To two decimal places, what is the standard score for a person with a raw score of 10?
7. Rounded to a whole number, what is the McCall's T score for a person with a raw score of 10?
8. To two decimal places, what is the standard score for a person with a raw score of 8?
9. Rounded to a whole number, what is the McCall's T score for a person with a raw score of 8?

Checking Your Prediction:

10. Does your analysis confirm your prediction in question 1?

Questions for Discussion:

11. Suppose you observed another boy interacting with his father and he obtained a standard score of +2.6. Is this high or low?
12. Suppose you observed another boy interacting with his father and he obtained a standard score of -1.99. How would you interpret his score?

¹Data source: Dr. Karen A. Matthews, University of Pittsburgh Medical Center, Pittsburgh, PA. For more information on this topic, see Matthews, K. A., Woodall, K. L., Kenyon, K., & Jacob, T. (1996). Negative family environment as a predictor of boys' future status on measures of hostile attitudes, interview behavior, and anger expression. *Health Psychology, 15*, 30-37.