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Using the t Test and t Distribution

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AIU claims that the average level of intrinsic job satisfaction of American workers is equal to 5. A sample of 25 AIU American workers was sampled. Is there enough evidence to reject AIU's claim at $\alpha = 0.05$? We need to determine the mean of the ratings that the 25 surveyed people gave. This is done by adding all the ratings together and dividing by 25 ($3.2 + 3.5 + 4.8 + 4.9 + 5.5 + 4.3 + 6.1 + 6.5 + 6.6 + 3.8 + 4.6 + 5.6 + 5.7 + 5.7 + 3.4 + 3.6 + 3.7 + 4.0 + 4.2 + 4.5 + 5.6 + 5.9 + 6.0 + 6.2 + 6.4 = 124.3/25 = 4.972$). Now, we can determine the standard deviation. This is done by subtracting 4.972 from each rating and squaring the number. Then you add up all of the calculations and divide by one less than the number of variable used. Then you take the square root of that number, and you have your standard deviation. For simplification, I used the standard deviation formulas built into Excel:

3.2	5.7	Standard	1.097163
3.5	3.4	Deviation	
4.8	3.6		
4.9	3.7		
5.5	4		
4.3	4.2		
6.1	4.5		
6.5	5.6		
6.6	5.9		
3.8	6		
4.6	6.2		
5.6	6.4		
5.7			

To check these answers, I then used the descriptive statistics feature built into the data analysis part of Excel:

	
Mean	4.972
Standard Error	0.219433
Median	4.9
Mode	5.6
Standard Deviation	1.097163
Sample Variance	1.203767
Kurtosis	-1.43641
Skewness	-0.11493
Range	3.4
Minimum	3.2
Maximum	6.6
Sum	124.3
Count	25

Now, I can continue and work the problem:

- Step 1 H_0 : The average satisfaction level of the American worker = 5 (claim) and
 H_1 : The average satisfaction level of the American worker < or > 5
- Step 2 The critical values are +2.060 and -2.060 for $\alpha = 0.05$ and d.f. = 25. The α or level of significance was chosen reasonably at random. Normal levels of significance used for testing are either 0.05 or 0.01. For this exercise I chose 0.05. The degrees of freedom or d.f. is a number which relates to sample size (Bluman, 2008, p. 415). Once these are set, you turn to the t-Distribution table. In this case, we will go to the number 25 under the d.f. column. Then, we will trace to the right until we come to the column that has 0.05 in it for two tails. We do two tails because the rating can fall above or below the claimed value of 5. We find the number 2.060.
- Step 3 $t = (X - \mu)/(s/\sqrt{n}) = (4.972 - 5)/(1.10/\sqrt{25}) = -0.028/(1.10/5) = -0.028/.22 =$

-0.127

Step 4 Accept the null hypothesis because -0.127 falls in between -2.060 and +2.060 making the hypothesis claim of $H_0: \mu = 5$ true.

z Test versus t Test

There is a general rule of thumb that when n or the number of participants is greater than 30, you use the z Test. When n is less than 30 you use the t Test.

References

Bluman, A.G. (2008). *Elementary Statistics: A step by step approach*. New York, NY:
McGraw-Hill.