PROBLEM STATEMENT 1   
It is known that a certain laboratory task takes the average person 2.5 seconds. A developmental psychologist was interested in whether older people take longer to perform this task. The psychologist tested 30 randomly selected 80-year-olds. Their mean time was 2.7 seconds, with an estimated population standard deviation of 1.4 seconds. What should the psychologist conclude (use the .05 level)?   
1. Restate the question as a research hypothesis and a null hypothesis about the populations.   
(2 points)   
2. Determine the characteristics of the comparison distribution:   
Population mean = (1 point)   
Population variance = (1 point)   
Standard deviation of the distribution of sample means = (1 point)   
Degrees of Freedom = (1 point)   
3. Determine the significance cutoff. Use the t table. (1 points)   
4. Determine your sample’s score on the comparison distribution. (2 points)   
5. Decide whether to reject the null hypothesis. (2 points)

Set Up Hypothesis  
Null Hypothesis H0: U = 2.5  
Alternate, mean response time of older people slower than the response time of people in general H1: U>2.5  
Test Statistic  
Population Mean(U)=2.5  
Given That X(Mean)=2.7  
Standard Deviation(S.D)=1.4  
Number (n)=30  
we use Test Statistic (Z) = x-U/(s.d/Sqrt(n))  
Zo=2.7-2.5/(1.4/Sqrt(30)  
Zo =0.7825  
| Zo | =0.7825  
Critical Value  
The Value of |Z ?| at LOS 0.05% is 1.64  
We got |Zo| =0.7825 & | Z ? | =1.64  
Make Decision  
Hence Value of |Zo | < | Z ? | and Here we Do not Reject Ho  
P-Value : Right Tail - Ha : ( P > 0.7825 ) = 0.217  
Hence Value of P0.05 < 0.217, Here We Do not Reject Ho

accept hypothesis, we don't have evidence that mean response time of older people slower than the response time of people in general

**Population 1: Population of times taken by the average person**

**Population 2: Population of times taken by older people**

Explanation:

H0: Null Hypothesis: \mu \leq 2.5 (The older people are not slower (do not take longer) on this task

HA: Alternative Hypothesis: \mu > 2.5 (The older people are slower ( take longer) on this task (Claim)

n = 30

\bar{x} = 2.7

\sigma = 1.4

Take \alpha = 0.05

From Table, critical value of Z = 1.64

Test Statistic is given by:

Z=\frac{\bar{x}-\mu _{0}}{\sigma /\sqrt{n}}=\frac{2.7-2.5}{1.4/\sqrt{30}}=0.782

Since calculated value of Z = 0.782 is less than critical value of Z = 1.64, the difference is not significant. Fail to reject null hypothesis.

By Technology,

p value = 0.217

Since p value = 0.217 is greater than \alpha = 0.05, the difference is not significant. Fail to reject null hypothesis.

Conclusion:  
The data do not support the claim that the older people are slower ( take longer) on this task.

PROBLEM STATEMENT 2   
A study tested the effects of science fiction movies on people’s belief in the supernatural. A   
scale was designed to measure the degree to which a person believes in the   
supernatural with high scores indicating high levels of belief. Seven participants   
completed the scale before and after watching a popular science fiction movie.   
Participants’ scores are listed below. Assume that the researcher had reason to expect   
participants to believe less in the supernatural after watching the movie.   
Belief-in-Supernatural Scores, Before and After Watching Science Fiction Movie.   
Carry out a t test for dependent means (use the .01 significance level).

Participant Before After   
A 3 3   
B 5 3   
C 9 6   
D 6 8   
E 7 8   
F 5 2   
G 4 1   
   
   
   
1. Restate the question as a research hypothesis and a null hypothesis about the populations.   
(2 points)   
2. Determine the characteristics of the comparison distribution:   
Population mean = (1 point)   
The variance of the distribution of means = (2 points)   
The estimated standard deviation of the population of difference scores = (1 point)   
The SD of distribution of means = (2 points)   
Degrees of Freedom = (1 point)   
3. Determine the significance cutoff. Use the t table. (1 points)   
4. Determine your sample’s score on the comparison distribution. (2 points)   
5. Decide whether to reject the null hypothesis. (2 points)

Solution:

A. Paired t-test is used because the data is dependent.

B. Step 1: Null Hypothesis (Ho): \mud \geq 0

Alternative Hypothesis (Ha): \mud < 0

Step 2: Level of significance,a = 0.05

Step 3: Test Statistics

t = (\bar{Xd} - \mu d)/(sd/sqrt(n))

t = (-1.143 - 0)/ (2.116/\sqrt7)

t = -1.43

Step 4: Reject or Fail to reject Ho

Degrees of freedom, df = n - 1 = 7 - 1 = 6

Using t-tables, the critical value is

t (a/2, df) = t (0.025, 6) = -2.447

Step 5: Conclusion

Since test statistics is greater than the critical value, we fail to reject Ho.

Hence, there is no significant difference in scores after watching a popular science fiction movie.

Calculations of \bar{Xd} and sd

|  |  |  |  |
| --- | --- | --- | --- |
| Before | After | d = After-before | (d - X-bard)^2 |
| 3 | 3 | 0 | 1.306449 |
| 5 | 3 | -2 | 0.734449 |
| 9 | 6 | -3 | 3.448449 |
| 6 | 8 | 2 | 9.878449 |
| 7 | 8 | 1 | 4.592449 |
| 5 | 2 | -3 | 3.448449 |
| 4 | 1 | -3 | 3.448449 |
|  | Sum = | -8 | 26.857143 |
|  |  | -1.142857143 |  |

\bar{Xd} = -1.143, sd = \sqrt(d-\bar{Xd})^2/(n-1) = \sqrt26.8571/6 = 2.116

C. 95% confidence interval is given by:-

\bar{Xd} \pm t (a/2, n - 1)*(sd/sqrt(n))

-1.143 \pm t (0.025, 6)\*(2.116/\sqrt(7))

-1.143 \pm 2.447\*0.7997

-1.143 \pm 1.957

-3.100, 0.814

D. Cohen's d = \bar{X d}/sd

Cohen's d = 1.143/2.116

Cohen's d = 0.54 (Medium effect)

Step 1:

H0: Null Hypothesis: Hd So (People believed more than or equal in the supernatural after watching the movie)

HA:Alternative Hypothesis: 0 < Prl (People believed less in the supernatural after watching the movie) (Claim)

Step 2:

From the given data, values of d = Before - After are got as follows:

d = Before - After = 0, 2, 3, - 2, - 1, 3 3

From d values, the following statistics are calculated:

n = Sample Size = 7

\bar{d} = Mean of d values = 1.143

sd = Standard Deviation of d values

Step 3:

\alpha = 0.01

df = 7 - 1 = 6

From Table, critical value of t = 3.143

Step 4:

The Test Statistic is calculated as follows:

t = =
Sdn
1.143
2.116/17

Step 5:

Since calculated value of t = 1.429 isless than critical value of t = 3.143, the difference is not significant. Fai lto reject null hypothesis.

Conclusion:

The data do not support the claim that eople believed less in the supernatural after watching the movie.

(b)

Effrect Sizeis given by:

d = 1.143
d= 118 = 0.5402