AS2: Choosing the Appropriate Hypothesis Test

SECTION I:

SCENARIO #1

A researcher hypothesizes that background music will have an effect on classroom performance. He selects a sample of n=50 students and randomly assigns the sample to either a non-music condition or a meditative music condition. He measures performance and is ready to analyze the data to conclude whether or not the data support his hypothesis.

What is the appropriate test? <u>Within-Subjects Design</u>

Why did you choose this test?

<u>The within-Subjects Design t-test is the appropriate test for this scenario because this test is used to compare the means of two independent groups.</u>

<u>In this study, the researcher is interested in comparing the performance of students in two groups: those who are in the non-music condition and those who are in the meditative music condition. The two groups are independent because each student can only be in one condition and the conditions do not affect each other.</u>

SCENARIO #2

Childhood participation in sports, cultural groups, and youth groups appears to be related to improved self-esteem for adolescents. In a representative study, a sample of n= 100 adolescents with a history of group participation is given a standardized self-esteem questionnaire. For the general population of adolescents, scores on this questionnaire form a normal distribution with a mean of $\mu = 50$ and a standard deviation of $\sigma = 15$. The sample of group-participation adolescents had a mean of M= 54.

What is the appropriate test? <u>One-sample t-test</u>

Why did you choose this test?

<u>One-sample t-test is used to determine whether the mean of a sample is significantly different from a known or hypothesized population mean. In this case, the known or hypothesized population mean is 50, which is the mean of self-esteem scores for the general population of adolescents. The sample mean is 54, which is the mean self-esteem score for the group of adolescents with a history of group participation.</u>

SCENARIO #3

Researchers have noted a decline in cognitive functioning as people age. However, the results from other research suggest that the antioxidants in foods such as blueberries may reduce and even reverse these age-related declines. To examine this phenomenon, suppose that a researcher obtains a sample of n=16 adults who are between the ages of 65 and 75. The researcher uses a standardized test to measure cognitive performance for each individual. The participants then begin a 2 month program in which they receive daily doses of a blueberry supplement. At the end of the 2-month period, the researcher gain measures cognitive performance for each participant.

 What is the appropriate test? dependent samples t-test.

 Why did you choose this test?

A dependent samples t-test is a statistical test used to compare the means of two related or paired samples. In this case, the cognitive performance of each participant is measured both before and after the 2-month program of receiving a daily blueberry supplement. Therefore, the two sets of scores are paired, and a paired samples t-test can be used to determine whether there is a significant difference between the pre-and post-program cognitive performance scores.

SCENARIO #4

When people learn a new task, their performance usually improves when they are tested the next day, but only if they get at least 6 hours of sleep. A researcher has a set of data that demonstrates this phenomenon. He had participants learn a visual discrimination task on one day, and then tested them on the task the following day. Half of his participants were allowed to have at least 6 hours of sleep and the other half of his participants were kept awake all night.

 What hypothesis test did the researcher likely use to analyze the data?

Answer: Between-Subject Design t-test

Why did you choose this hypothesis test?

The between-subject t-test is normally used to compare the means of two groups and determine if they are significantly different from each other. In this case, we have half of the researcher's participants have at least 6 hours of sleep, and the other half of the participants have to be awake all night.

SCENARIO #5

Researchers wanted to investigate whether soccer players (who can sometimes get hit in the head with the ball) suffered any neurological deficits. These researchers measured neurological deficits in soccer players and compared the soccer player data to the data of non-soccer players believed to not engage in any other activity that could deliver blows to the head. The researchers did find significant differences between the soccer players and the non-soccer players.

What hypothesis test did the researchers most likely use to analyze the data?

Answer: <u>Between-Subject Designs</u>

Why did you choose this hypothesis test?

<u>The between-subject t-test is normally used to compare the means of two groups and determine if they are significantly different from each other. In this case, the researchers are comparing the means of two different groups (soccer players and non-soccer players) on a continuous variable (neurological deficits).</u>

SCENARIO #6

A researcher was interested in studying whether watching television, especially medical shows such as Grey's Anatomy and House, can result in increased concern about personal health. She randomized a sample of n=75 to three conditions: little or none medical show television watching, moderate medical show television watching, and substantial medical television watching for six months. After six months, all participants were measured on a hypochondriac scale.

What hypothesis test should the researcher use to analyze her data?

Answer: <u>one-way ANOVA</u>

Why did you choose this hypothesis test?

<u>As the researcher is comparing the means of three different groups (the three conditions: little or nonmedical show television watching, moderate medical show television watching, and substantial medical television watching) on the dependent variable (hypochondriac scale).</u>

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SECTION II:

This section requires that you choose the appropriate hypothesis test for each data set, run the test on SPSS, and write up your conclusions in APA format.

1. Analyze the following data from a randomized two group experiment, using the appropriate hypothesis test:

	Control	Experimental
	2, 3, 5, 7, 4, 3, 2, 1, 5, 3,	4, 6, 5, 7, 8, 9, 7, 6, 8, 7

Cut and paste your SPSS results here:

Group Statistics

VAR00002		N	Mean	Std. Deviation	Std. Error Mean
VAR00001	1.00	10	6.7000	1.49443	.47258
	2.00	10	3.5000	1.77951	.56273

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
VAR00001	Equal variances assumed	.334	.571	4.355	18	<.001	<.001	3.20000	.73485	1.65614	4.74386
	Equal variances not assumed			4.355	17.478	<.001	<.001	3.20000	.73485	1.65283	4.74717

Write up your research results here:
The mean for the number of the experimental group was M=6.7 with an SD = 1.49. The mean for the number of the control group was M=3.5 with an SD =1.77. t (18) =4.355, p>0.05. Our data does not support that the experimental group had an effect on the control group. Therefore, the data failed to reach significance.

2. Analyze the following data from a within-subjects design measuring heart rate before and after watching a horror film:

Before	After
60	70
72	74
75	78
80	85
71	78
62	65
64	72

Cut and Paste your SPSS results here:

Group Statistics

	VAR00002	N	Mean	Std. Deviation	Std. Error Mean
VAR00001	1.00	7	74.5714	6.47707	2.44810
	2.00	7	69.1429	7.35818	2.78113

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
VAR00001	Equal variances assumed	.410	.534	1.465	12	.084	.169	5.42857	3.70512	-2.64418	13.50133
	Equal variances not assumed			1.465	11.810	.084	.169	5.42857	3.70512	-2.65862	13.51576

Write up your research results here:
 The mean for the number of after watching a horror film was M=74.5 with an SD = 6.47. The mean for the number of before watching a horror film was M=69.1 with an SD =7.35. t (12) =1.465, p>0.05. Our data does not support that the number of after watching a horror film had an effect on the number before watching a horror film. Therefore, the data failed to reach significance.

3. Analyze the following data from a randomized experiment that examined the effect of hours of sleep on happiness.

6 hours	8 hours	10 hours
18	6	4
13	11	9
19	7	5
12	9	6
16	8	5
12	13	7

Cut and paste your SPSS results here:

ANOVA

VAR00001

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	252.000	2	126.000	19.286	<.001
Within Groups	98.000	15	6.533		
Total	350.000	17			

Multiple Comparisons

Dependent Variable: VAR00001
Scheffe

(I) VAR00002	(J) VAR00002	Mean Difference (I–J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1.00	2.00	6.00000*	1.47573	.004	1.9952	10.0048
	3.00	9.00000*	1.47573	<.001	4.9952	13.0048
2.00	1.00	−6.00000*	1.47573	.004	−10.0048	−1.9952
	3.00	3.00000	1.47573	.161	−1.0048	7.0048
3.00	1.00	−9.00000*	1.47573	<.001	−13.0048	−4.9952
	2.00	−3.00000	1.47573	.161	−7.0048	1.0048

*. The mean difference is significant at the 0.05 level.

Write up your research results here:

The results revealed a significant main effect of hours of sleep on happiness, F (2, 15) = 19.286, p < .001. The data indicate a significant difference between the 8 hours and the 6 hours conditions, and between 10 hours and 6 hours. However, there is no statistically significant difference between the 6 hours and the 10 hours group.