

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? Independent Samples T- test

Why did you choose this test? An independent samples t-test is the appropriate statistical test for the researcher's study investigating the effects of background music on classroom performance. The study involves two independent groups (music and non-music) and a continuous dependent variable (classroom performance). The independent samples t-test is a commonly used statistical test for comparing the means of two independent groups, and it assumes normally distributed data and homogeneity of variance.

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? One sample t-test

Why did you choose this test? One sample t test is used to determine if a sample mean is significantly different from a known or hypothesized population mean. In this case, the researcher is interested in comparing the sample mean of self-esteem scores ($M = 54$) for adolescents with a history of group participation to the known population mean ($\mu = 50$) for the general population of adolescents. The one-sample t-test allows the researcher to determine whether the difference between the sample mean and the population mean is statistically significant.

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? Paired samples t-test

Why did you choose this test?

Paired samples t test is used to compare the means of two related groups. In this study, the same individuals are measured twice, before and after the blueberry supplement intervention. The paired samples t-test would allow the researcher to compare the mean cognitive performance scores before and after the intervention to determine if there is a significant change in cognitive functioning due to the blueberry supplement intervention. This test is appropriate because it controls for individual differences between the participants and increases the power of the statistical test, as each participant serves as their own control. _____

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: Independent samples t test

Why did you choose this hypothesis test?

The study involves two independent groups (those who were allowed to have at least 6 hours of sleep and those who were kept awake all night) and a continuous dependent variable (performance on the visual discrimination task). An independent samples t-test is commonly used to compare the means of two independent groups, and would allow the researcher to determine if there is a significant difference in performance on the visual discrimination task between the two groups. The researcher would compare the mean performance scores of the two groups to determine if the difference in sleep had a significant effect on performance.

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: Independent samples t-test

Why did you choose this hypothesis test? The study involves two independent groups (soccer players and non-soccer players) and a continuous dependent variable (neurological deficits). An independent samples t-test is commonly used to compare the means of two independent groups, and would allow the researchers to determine if there is a significant difference in neurological deficits between the two groups. The researchers would compare the mean neurological deficit scores of the soccer players and non-soccer players to determine if the difference between the groups is statistically significant.

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: One-way ANOVA

Why did you choose this hypothesis test? The one-way ANOVA would allow the researcher to determine if there is a significant difference in hypochondriac scale scores among the three

conditions. If the ANOVA reveals a significant difference, the researcher can conduct post-hoc tests to determine which groups differ significantly from each other.

Go on to next page...

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:

The screenshot displays the SPSS T-Test output window. It includes the following sections:

- Group Statistics:** A table showing the mean and standard deviation for each group.
- Independent Samples Test:** A table showing the results of Levene's Test for Equality of Variances and the t-test for Equality of Means.
- Independent Samples Effect Sizes:** A table showing Cohen's d, Hedges' correction, and Glass's delta.

Group Statistics

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

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of Difference	
						One-Sided p	Two-Sided p			Lower	Upper
VAR00001	Equal variances assumed	.334	.571	-4.355	18	<.001	<.001	-3.20000	.73485	-4.74386	-1.6
	Equal variances not assumed			-4.355	17.478	<.001	<.001	-3.20000	.73485	-4.74717	-1.6

Independent Samples Effect Sizes

		Standardizer ^a	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
VAR00001	Cohen's d	1.64317	-1.947	-3.010	-.849
	Hedges' correction	1.71584	-1.865	-2.882	-.813
	Glass's delta	1.49443	-2.141	-3.426	-.806

a. The denominator used in estimating the effect sizes.
 Cohen's d uses the pooled standard deviation.
 Hedges' correction uses the pooled standard deviation, plus a correction factor.
 Glass's delta uses the sample standard deviation of the control group.

IBM SPSS Statistics Processor is ready | Unicode:ON

Write up your research results here:

The mean for the control group was $M=3.5$ with a $SD=1.77$. The mean for the experimental group was $M=6.7$ with a $SD=1.49$. The data failed to reach significance. $t(18) = -4.355, p > .05$

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:

Write up your research results here:

The mean heart rate before watching a horror film is $M=69.14$ with a $SD= 7.35$. The mean heart rate after watching a horror film is 74.57 with a $SD=6.47$. $t(6)=4.800, p < .05$. Our data was significant. The findings suggest that watching a horror film is associated with a significant increase in heart rate.

T-Test

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 VAR00001	74.5714	7	6.47707	2.44810
VAR00002	69.1429	7	7.35818	2.78113

Paired Samples Correlations

	N	Correlation	Significance	
			One-Sided p	Two-Sided p
Pair 1 VAR00001 & VAR00002	7	.914	.002	.004

Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Significance	
				Lower	Upper			One-Sided p	Two-Sided p
Pair 1 VAR00001 - VAR00002	5.42857	2.99205	1.13089	2.66138	8.19576	4.800	6	.001	.003

Paired Samples Effect Sizes

		Standardizer ^a	Point Estimate	95% Confidence Interval	
				Lower	Upper
Pair 1 VAR00001 - VAR00002	Cohen's d	2.99205	1.814	.547	3.036
	Hedges' correction	3.44458	1.576	.475	2.637

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

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:

Write up your research results here:

The data was analyzed using a one-way ANOVA test, which showed a significant difference between the means of the three groups ($F(2, 15) = 19.286, p < .001$). Post-hoc analyses using the Scheffe method revealed that the mean difference between the group that spent 6 hours on the task and the group that spent 10 hours was significant (mean difference = 6, $p = .004$).

Paired Samples Effect Sizes

Pair 1	VAR00001 - VAR00002	Standardizer ^a	Point Estimate	95% Confidence Interval	
				Lower	Upper
		Cohen's d	2.99205	1.814	3.036
		Hedges' correction	3.44458	1.576	2.637

a. The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation of the mean difference. Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Descriptives

VAR00001	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1.00	6	15.0000	3.09839	1.26491	11.7484	18.2516	12.00	19.00
2.00	6	9.0000	2.60768	1.06458	6.2634	11.7366	6.00	13.00
3.00	6	6.0000	1.78885	.73030	4.1227	7.8773	4.00	9.00
Total	18	10.0000	4.53743	1.06948	7.7436	12.2564	4.00	19.00

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			

ANOVA Effect Sizes^a

VAR00001		Point Estimate	95% Confidence Interval	
			Lower	Upper
	Eta-squared	.720	.345	.820
	Epsilon-squared	.683	.258	.796
	Omega-squared Fixed-effect	.670	.247	.786
	Omega-squared Random-effect	.504	.141	.648

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Post Hoc Tests

Dependent Variable: VAR00001
Scheffe

Multiple Comparisons

(i) VAR00002	(j) VAR00002	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	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.

Homogeneous Subsets

