Data Source: https://www.sheffield.ac.uk/mash/statistics/datasets.

Research Question: Which diet was best for losing weight?

One-Way ANOVA Analysis

Descriptive Statistics

Dependent Variable: Weight lost (kg)

Diet	Mean	Std. Deviation	N
1	3.3000	2.24015	24
2	3.0259	2.52337	27
3	5.1481	2.39557	27
Total	3.8449	2.55148	78

Based on the descriptive statistics above, Mean and Std. Deviation are the mean score and standard deviation of each diet respectively. N is the sample size under consideration.

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Weight lost (kg)	Based on Mean	.659	2	75	.520
	Based on Median	.626	2	75	.538
	Based on Median and with adjusted df	.626	2	73.794	.538
	Based on trimmed mean	.675	2	75	.512

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: Weight lost (kg)

b. Design: Intercept + Diet

The table above indicates that, homogeneity of variance was not nonsignificant, p= 0.52 (i.e., p>0.05).

Tests of Between-Subjects Effects

Dependent Variable: Weight lost (kg)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	71.094[a]	2	35.547	6.197	.003	.142
Intercept	1137.494	1	1137.494	198.317	.000	.726
Diet	71.094	2	35.547	6.197	.003	.142
Error	430.179	75	5.736			
Total	1654.350	78				
Corrected Total	501.273	77				

a. R Squared = .142 (Adjusted R Squared = .119)

The table above was used to determine if the overall ANOVA was significant. The test was significant, $F(2, 75) = 6.197$, $p = .003$. Because $p<0.05$, we reject the null hypothesis that there are no differences among the diets. The η^2 of .142 indicate a strong relationship between the diets and weight lost (kg).

Post Hoc Tests
Diet

Multiple Comparisons

Dependent Variable: Weight lost (kg)

	(I) Diet	(J) Diet	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	.2741	.67188	.912	-1.3325	1.8806
		3	-1.8481*	.67188	.020	-3.4547	-.2416
	2	1	-.2741	.67188	.912	-1.8806	1.3325
		3	-2.1222*	.65182	.005	-3.6808	-.5636
	3	1	1.8481*	.67188	.020	.2416	3.4547
		2	2.1222*	.65182	.005	.5636	3.6808
Dunnett C	1	2	.2741	.66703		-1.3895	1.9377
		3	-1.8481*	.64934		-3.4679	-.2284
	2	1	-.2741	.66703		-1.9377	1.3895
		3	-2.1222*	.66961		-3.7861	-.4583
	3	1	1.8481*	.64934		.2284	3.4679
		2	2.1222*	.66961		.4583	3.7861

Based on observed means.
The error term is Mean Square(Error) = 5.736.

*. The mean difference is significant at the .05 level.

Homogeneous Subsets

Weight lost (kg)

	Diet	N	Subset 1	Subset 2
Tukey HSD[a,b,c]	2	27	3.0259	
	1	24	3.3000	
	3	27		5.1481
	Sig.		.911	1.000
Ryan-Einot-Gabriel-Welsch Range[c]	2	27	3.0259	
	1	24	3.3000	
	3	27		5.1481
	Sig.		.693	1.000

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 5.736.

a. Uses Harmonic Mean Sample Size = 25.920.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

The tables above were used as follow up to evaluate pair-wise differences among the means. This indicates that diet 1, 2 and 3 differed significantly from one another.

APA for 1-Way ANOVA

One-way analysis of variance was conducted to evaluate the relationship between diet and weight loss. The independent variable, the diet factor, included three levels: 1, 2 and 3. The dependent variable was the weight loss. The ANOVA was significant, $F(2, 75) = 6.197$, $p = .003$. The strength of relationship between diet and weight, as assessed by η^2, was strong, with diet factor accounting for 14.2% of the variance of the dependent variable.

Follow up tests were conducted to evaluate pairwise differences among the means. Because the variances among the three groups ranged from 5.02 to 6.50 (Std. 2.24 – 2.55), we chose not to assume that the variances were homogenous and conducted post hoc comparison with the use of the Dunnett's C test, a test that does not assume equal variances among the three diets. There was a significant difference between diet 1 and diet 3 and between diet 2 and diet 3, but no significant difference between diet 1 and diet 2. Diet 2 showed a greater decrease in the weight lost in comparison to diet 1. The 95% confidence intervals for the pair-wise differences, as well as the means and standard deviations for the three diets, are reported in the table below:

95% Confidence Intervals of Pair-wise Differences in Mean Changes in Weight Lost

Diet	M	SD	Diet 1	Diet 2
1	3.30	2.24		
2	3.03	2.52	[-1.39, 1.94]	
3	5.15	2.40	[-3.47, -.23]	[-3.78, -.46]

Kruskal-Wallis H test Analysis

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Weight lost (kg)	78	3.8449	2.55148	-2.10	9.20
Diet	78	2.04	.813	1	3

N is the total sample sizes of the dependent (weight loss) and independent (diet 1, diet 2 and diet 3) variables 78 respectively for both. The mean is the average weight loss, 3.845 and of independent variable (diet 1, diet 2 and diet 3), 2.04. The standard deviation was 2.55 for weight loss and .813, for independent variables (diet 1, diet 2 and diet 3) respectively. The minimum values were, -2.10 and 1 for dependent (weight loss) and independent (diet 1, diet 2 and diet 3) variables respectively and the maximum values were, 9.20 and 3 for dependent (weight lost) and independent (diet 1, diet 2 and diet 3) variables respectively.

Ranks

	Diet	N	Mean Rank
Weight lost (kg)	1	24	33.50
	2	27	33.43
	3	27	50.91
	Total	78	

The table above provided N which is the sample size of diet 1, diet 2, and diet 3 which are 24, 27 and 27 respectively and their mean ranks of 33.50, 33.43, and 50.91 respectively.

Test Statistics[a,b]

	Weight lost (kg)
Kruskal-Wallis H	10.471
df	2
Asymp. Sig.	.005

a. Kruskal Wallis Test

b. Grouping Variable: Diet

The table above provided the Kruskal-Wallis H value, 10.47, the degree of freedom 2 and the p-value, .005 which are essential in finding the effect later.

APA for Kruskal-Wallis H test

A Kruskal-Wallis H test was conducted to evaluate the differences among the diets (1, 2 and 3) on weight loss. The results of the test were significant ($p = 0.005$), $p<.05$. Therefore, we reject the null hypothesis that there was no difference between the mean of the diets. The mean rank of 33.43 for diet 2, indicates a less weight and a better weight lost compared to the two other diets.