

Statistical Analysis in the pilot study for students with effective participation

Table 1: Two-way ANOVA and Scheirer-Ray-Hare in the pilot study for students with effective participation

	Sum Sq	Df	F value	Pr(>F)	Sig	Df	Sum Sq	H	p.value	Sig
Interest/Enjoyment.(Intercept)	278.842	1	201.754	0.000						
Interest/Enjoyment.Type	4.597	1	3.326	0.086		1	90.054	2.347	0.126	
Interest/Enjoyment.CLRole	0.134	1	0.097	0.760		1	7.058	0.184	0.668	
Interest/Enjoyment.Type:CLRole	2.505	1	1.812	0.196		1	37.501	0.977	0.323	
Interest/Enjoyment.Residuals	23.496	17				17	632.888			
Perceived Choice.(Intercept)	286.832	1	206.623	0.000						
Perceived Choice.Type	5.831	1	4.200	0.056		1	42.000	1.098	0.295	
Perceived Choice.CLRole	1.041	1	0.750	0.398		1	1.458	0.038	0.845	
Perceived Choice.Type:CLRole	6.609	1	4.761	0.043	*	1	155.429	4.064	0.044	*
Perceived Choice.Residuals	23.599	17				17	566.113			
Pressure/Tension.(Intercept)	160.823	1	126.884	0.000						
Pressure/Tension.Type	3.790	1	2.990	0.102		1	123.429	3.242	0.072	
Pressure/Tension.CLRole	0.000	1	0.000	0.996		1	0.525	0.014	0.907	
Pressure/Tension.Type:CLRole	0.000	1	0.000	0.996		1	1.371	0.036	0.849	
Pressure/Tension.Residuals	21.547	17				17	636.175			
Effort/Importance.(Intercept)	432.247	1	368.259	0.000						
Effort/Importance.Type	0.554	1	0.472	0.501		1	15.482	0.414	0.520	
Effort/Importance.CLRole	0.302	1	0.257	0.619		1	16.858	0.450	0.502	
Effort/Importance.Type:CLRole	0.234	1	0.200	0.661		1	2.072	0.055	0.814	
Effort/Importance.Residuals	19.954	17				17	714.087			
Intrinsic Motivation.(Intercept)	330.875	1	854.951	0.000						
Intrinsic Motivation.Type	2.286	1	5.906	0.026	*	1	133.929	3.479	0.062	
Intrinsic Motivation.CLRole	0.075	1	0.194	0.665		1	2.100	0.055	0.815	
Intrinsic Motivation.Type:CLRole	0.676	1	1.747	0.204		1	36.021	0.936	0.333	
Intrinsic Motivation.Residuals	6.579	17				17	597.950			

Signif. codes: 0 *** 0.01 ** 0.05

Table 2: Summary of Pair wilcoxon in the pilot study for students with effective participation

	Group	N	Median	Mean.Ranks	Sum.Ranks	U	Z	p.value	r	magnitude
Perceived Choice.Type:CLRole.greater.1	non-gamified.Apprentice	5	5.00	5.00	25	10	1.97	0.048	0.745	large
Perceived Choice.Type:CLRole.greater.2	non-gamified.Master	2	2.80	1.50	3	10	1.97	0.048	0.745	large
Perceived Choice.Type:CLRole.two.sided.1	non-gamified.Apprentice	5	5.00	5.00	25	10	1.97	0.048	0.745	large
Perceived Choice.Type:CLRole.two.sided.2	non-gamified.Master	2	2.80	1.50	3	10	1.97	0.048	0.745	large
Pressure/Tension.Type.greater.1	non-gamified	7	3.75	14.43	101	73	1.80	0.038	0.393	medium
Pressure/Tension.Type.greater.2	ont-gamified	14	2.88	9.29	130	73	1.80	0.038	0.393	medium
Intrinsic Motivation.Type.less.1	non-gamified	7	4.45	7.43	52	24	-1.87	0.033	0.407	medium
Intrinsic Motivation.Type.less.2	ont-gamified	14	4.94	12.79	179	24	-1.87	0.033	0.407	medium

1 Descriptive Statistics and Assumptions for Parametric Tests

Table 3: Descriptive statistics in the pilot study for students with effective participation

	n	Mean	Std.Dev	Median	Min	Max	25th	75th	Skew	Kurtosis
Interest/Enjoyment	21	4.363	1.215	4.500	2.112	6.971	3.667	5.000	0.141	-0.629
Perceived Choice	21	4.563	1.272	4.800	2.600	6.400	3.600	5.600	-0.059	-1.448
Pressure/Tension	21	3.082	1.144	3.000	1.000	5.224	2.250	3.750	0.069	-0.968
Effort/Importance	21	5.340	1.027	5.000	4.000	7.000	4.333	6.333	0.089	-1.500
Intrinsic Motivation	21	4.789	0.667	4.787	3.783	6.267	4.233	5.042	0.514	-0.498

Table 4: Multivariate normality test in the pilot study for students with effective participation

	Test	Statistic	p value	Result
1	Mardia Skewness	23.1120783074338	0.938405170085124	YES
2	Mardia Kurtosis	-0.92270482070617	0.356161052953615	YES
3	MVN			YES

Table 5: Univariate normality test in the pilot study for students with effective participation

	Test	Variable	Statistic	p value	Normality
1	Shapiro-Wilk	Interest/Enjoyment	0.9840	0.9712	YES
2	Shapiro-Wilk	Perceived Choice	0.9314	0.1466	YES
3	Shapiro-Wilk	Pressure/Tension	0.9732	0.8028	YES
4	Shapiro-Wilk	Effort/Importance	0.9049	0.0436	NO
5	Shapiro-Wilk	Intrinsic Motivation	0.9594	0.5044	YES

Table 6: Notes to be taken into account about sample size in the pilot study for students with effective participation

	code	description
Interest/Enjoyment.Type.1	WARN: sample.size	current size is 5 and recommended size is 15 for the group: 'non-gamified:Apprentice'.
Interest/Enjoyment.Type.2	WARN: sample.size	current size is 10 and recommended size is 15 for the group: 'ont-gamified:Apprentice'.
Interest/Enjoyment.Type.3	FAIL: min.size	current size is 2 but the minimal recommended size is 5 for the group: 'non-gamified:Master'.
Interest/Enjoyment.Type.4	FAIL: min.size	current size is 4 but the minimal recommended size is 5 for the group: 'ont-gamified:Master'.
Perceived Choice.Type.1	WARN: sample.size	current size is 5 and recommended size is 15 for the group: 'non-gamified:Apprentice'.
Perceived Choice.Type.2	WARN: sample.size	current size is 10 and recommended size is 15 for the group: 'ont-gamified:Apprentice'.
Perceived Choice.Type.3	FAIL: min.size	current size is 2 but the minimal recommended size is 5 for the group: 'non-gamified:Master'.
Perceived Choice.Type.4	FAIL: min.size	current size is 4 but the minimal recommended size is 5 for the group: 'ont-gamified:Master'.
Pressure/Tension.Type.1	WARN: sample.size	current size is 5 and recommended size is 15 for the group: 'non-gamified:Apprentice'.
Pressure/Tension.Type.2	WARN: sample.size	current size is 10 and recommended size is 15 for the group: 'ont-gamified:Apprentice'.
Pressure/Tension.Type.3	FAIL: min.size	current size is 2 but the minimal recommended size is 5 for the group: 'non-gamified:Master'.
Pressure/Tension.Type.4	FAIL: min.size	current size is 4 but the minimal recommended size is 5 for the group: 'ont-gamified:Master'.
Effort/Importance.Type.1	WARN: sample.size	current size is 5 and recommended size is 15 for the group: 'non-gamified:Apprentice'.
Effort/Importance.Type.2	WARN: sample.size	current size is 10 and recommended size is 15 for the group: 'ont-gamified:Apprentice'.
Effort/Importance.Type.3	FAIL: min.size	current size is 2 but the minimal recommended size is 5 for the group: 'non-gamified:Master'.
Effort/Importance.Type.4	FAIL: min.size	current size is 4 but the minimal recommended size is 5 for the group: 'ont-gamified:Master'.
Intrinsic Motivation.Type.1	WARN: sample.size	current size is 5 and recommended size is 15 for the group: 'non-gamified:Apprentice'.
Intrinsic Motivation.Type.2	WARN: sample.size	current size is 10 and recommended size is 15 for the group: 'ont-gamified:Apprentice'.
Intrinsic Motivation.Type.3	FAIL: min.size	current size is 2 but the minimal recommended size is 5 for the group: 'non-gamified:Master'.
Intrinsic Motivation.Type.4	FAIL: min.size	current size is 4 but the minimal recommended size is 5 for the group: 'ont-gamified:Master'.

Recent studies carried out through simulations have indicated that ANOVA is reliable even when the data are non-normally distributed and the sample size is greater than 15 observations for each group. This size value is based on the Reference: Rana, R. K., Singhal, R., & Dua, P. (2016). Deciphering the dilemma of parametric and nonparametric tests. Journal of the Practice of Cardiovascular Sciences, 2(2), 95.

The sample size to carried out any parametric and non-parametric analysis is 5, and it was established using common sense. The warning and fails indicated in this section should be taking into account when a paper or report will be elaborated.