Statistical Analysis in the third study for signed-up students

Table 1: Two-way ANOVA and Scheirer-Ray-Hare in the third study for signed-up students

	Sum Sq	Df	F value	Pr(>F)	Sig	Df	Sum Sq	H	p.value	Sig
difScore.(Intercept)	0.135	1	0.021	0.886						
difScore.Type	70.102	1	10.772	0.002	**	1	1606.020	7.867	0.005	**
difScore.CLRole	60.426	1	9.285	0.004	**	1	1452.196	7.113	0.008	**
difScore.Type:CLRole	0.505	1	0.078	0.782		1	33.320	0.163	0.686	
difScore.Residuals	292.855	45				45	6707.964			

Signif. codes: 0 “**” 0.01 “*” 0.05

Table 2: Summary of Tukey post-hoc in the third study for signed-up students

	N	mean	lsmean	SE	df	lwr.CI	upr.CI	t.ratio	p.value	p.ajd	g
difScore.ont-gamified - w/o-gamified:ont-gamified - w/o-gamified	49	2.468	2.650	0.808		0.997	3.939	3.282	0.002	0.002	0.885
difScore.ont-gamified.Apprentice - w/o-gamified.Apprentice:ont-gamified.Apprentice - w/o-gamified.Apprentice	35	2.426	2.426	0.866		0.116	4.735	2.802	0.007	0.036	0.892

Table 3: Summary of Pair wilcoxon in the third study for signed-up students

	Group	N	Median	Mean.Ranks	Sum.Ranks	U	Z	p.value	r	magnitude
difScore.Type.greater.1	ont-gamified	23	2.24	31.09	715.0	439.0	2.80	0.002	0.401	medium
difScore.Type.greater.2	w/o-gamified	26	−0.37	19.62	510.0	439.0	2.80	0.002	0.401	medium
difScore.Type.two.sided.1	ont-gamified	23	2.24	31.09	715.0	439.0	2.80	0.004	0.401	medium
difScore.Type.two.sided.2	w/o-gamified	26	−0.37	19.62	510.0	439.0	2.80	0.004	0.401	medium
difScore.Type:CLRole.greater.1	ont-gamified.Apprentice	16	2.58	22.69	363.0	227.0	2.48	0.006	0.420	medium
difScore.Type:CLRole.greater.2	w/o-gamified.Apprentice	19	0.66	14.05	267.0	227.0	2.48	0.006	0.420	medium
difScore.Type:CLRole.two.sided.1	ont-gamified.Apprentice	16	2.58	22.69	363.0	227.0	2.48	0.012	0.420	medium
difScore.Type:CLRole.two.sided.2	w/o-gamified.Apprentice	19	0.66	14.05	267.0	227.0	2.48	0.012	0.420	medium
difScore.Type:CLRole.greater.11	ont-gamified.Apprentice	16	2.58	15.00	240.0	104.0	3.21	0.000	0.669	large
difScore.Type:CLRole.greater.21	w/o-gamified.Master	7	−3.16	5.14	36.0	104.0	3.21	0.000	0.669	large
difScore.Type:CLRole.two.sided.11	ont-gamified.Apprentice	16	2.58	15.00	240.0	104.0	3.21	0.001	0.669	large
difScore.Type:CLRole.two.sided.21	w/o-gamified.Master	7	−3.16	5.14	36.0	104.0	3.21	0.001	0.669	large
difScore.Type:CLRole.greater.12	ont-gamified.Master	7	1.06	9.86	69.0	41.0	2.11	0.019	0.563	large
difScore.Type:CLRole.greater.22	w/o-gamified.Master	7	−3.16	5.14	36.0	41.0	2.11	0.019	0.563	large
difScore.Type:CLRole.two.sided.12	ont-gamified.Master	7	1.06	9.86	69.0	41.0	2.11	0.038	0.563	large
difScore.Type:CLRole.two.sided.22	w/o-gamified.Master	7	−3.16	5.14	36.0	41.0	2.11	0.038	0.563	large
difScore.Type:CLRole.greater.13	w/o-gamified.Apprentice	19	0.66	15.82	300.5	110.5	2.54	0.004	0.499	medium
difScore.Type:CLRole.greater.23	w/o-gamified.Master	7	−3.16	7.21	50.5	110.5	2.54	0.004	0.499	medium
difScore.Type:CLRole.two.sided.13	w/o-gamified.Apprentice	19	0.66	15.82	300.5	110.5	2.54	0.009	0.499	medium
difScore.Type:CLRole.two.sided.23	w/o-gamified.Master	7	−3.16	7.21	50.5	110.5	2.54	0.009	0.499	medium

1 Assumptions for Parametric Tests

Table 4: Univariate normality test in the third study for signed-up students

	normality.fail	W	p.value
difScore	FALSE	0.983	0.715

Table 5: Notes to be taken into account about sample size in the third study for signed-up students

code		description
difScore.Type.1	WARN: sample.size	current size is 7 and recommended size is 15 for the group: 'ont-gamified:Master'.
difScore.Type.2	WARN: sample.size	current size is 7 and recommended size is 15 for the group: 'w/o-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 thatn 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.