

**Correlations Between Category Score and Placement By Competitor at the Lone Star
Championships 2021**

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American Drill Report

Abstract

In competitive rifle exhibition drill, there are many common refrains related to the judging and scoring of routines. These include but are not limited to, specific categories on the scoresheet influence placement more than others and specific judges influence placement more than others. To begin looking for any truth to these statements, data from the Lone Star Championships 2021 (LSC) was used to create correlational models relating individual judges and their scores to competitor placement in the preliminary round. This dataset suggests that at LSC 2021, individual categories did strongly correlate ($r \geq 0.90$) to placement, these being “Impression”, “Composition and Flow”, “Handling”, “Marching”, “Precision”, and “Showmanship”.

Introduction

Scoring well, and winning, a rifle exhibition competition is an imperfect art. With no manual to follow, complete creative control over the routine, and not knowing who the judges are ahead of time, simply designing a winning performance is its own daunting task. At the highest level, this entails utilizing the one piece of information given, the scoresheet (Fig. 1). The scoresheet is the only insight into how a competitor will be ranked amongst their peers, but it too is an imperfect tool. The scoresheet shown in Figure 1 is the scoresheet currently utilized at nearly every high-level rifle exhibition competition in the country, yet little data exists on how to use it effectively to the competitor’s advantage.

The scoresheet itself is wholly subjective, with judges given free reign over how to allocate their points to competitors. Some minor instruction is typically given on what the categories are looking for, but this instruction varies from competition to competition. Experienced and inexperienced judges alike are mixed in to judge together. As one can imagine, this has led to several speculations among competitors and spectators on what matters most. Some believe individual categories effect overall placement more than other categories. Some believe that individual judges effect overall placement more than other judges.

For the first time, a complete data set of scores was given out allowing correlational analysis to take place.

Methods

A complete data set of competitor scores from the Lone Star Championships 2021, held in San Antonio, Texas, was used for this analysis. Data includes overall placement, judge-by-judge total scores for each competitor, and category-by-category scores from each judge separated by competitor. Only data from the preliminary round was used.

Microsoft Excel was used to organize data into a full competitor-by-competitor table (App. A). This table gives full breakdown of individual category scores by judge for each competitor, with each judge's total score at the end of row and each competitor's individual category score at the bottom of each column.

To test how strongly a category correlated with a competitor's overall placement, graphs were made in excel with the x-axis as competitor's placement and the y-axis as total category score (Figs. 2 – 13). The cut-off for a "strong" correlation was set at $r \geq -.90$. The cut-off for a "medium" correlation was $r \geq -0.40$. All correlation coefficients were expected to be negative due to the x-axis "decreasing" in placement but the y-axis "increasing" in score.

To test how strongly an individual judge's total score for a competitor correlated with a competitor's overall placement, a similar method was followed with graphs being created with x-axis being competitor placement and the y-axis being score given (Figs. 14 - 21). The same correlation coefficient cutoffs were utilized.

To better visualize overall score trends, a graph that plots every competitor's score in each category by overall placement was created using the table in Appendix A. No statistical analysis was done directly on this graph.

DATA

Graphs for how strongly categories correlated with an individual's overall placement. Note: r^2 is shown on the graph but r was used for strength of correlation.

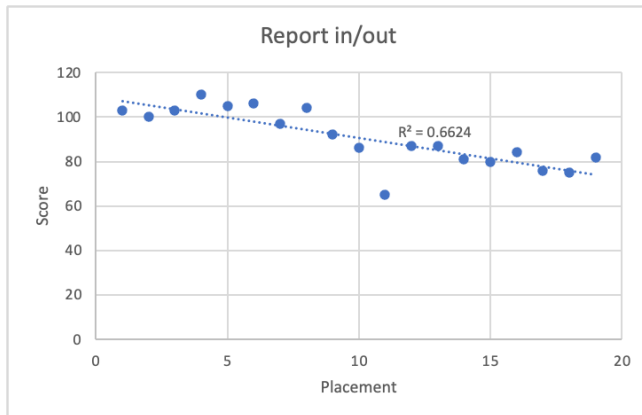


Figure 2

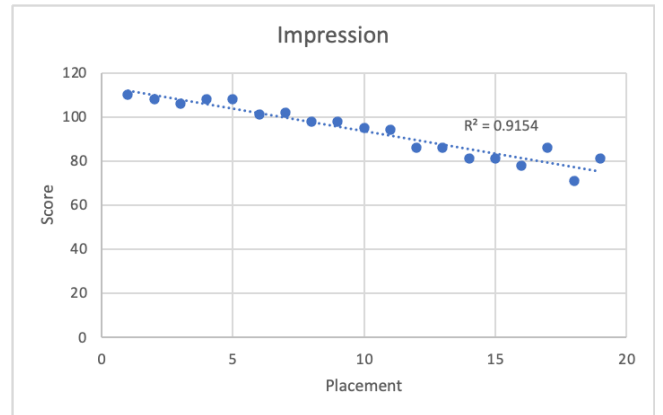


Figure 3

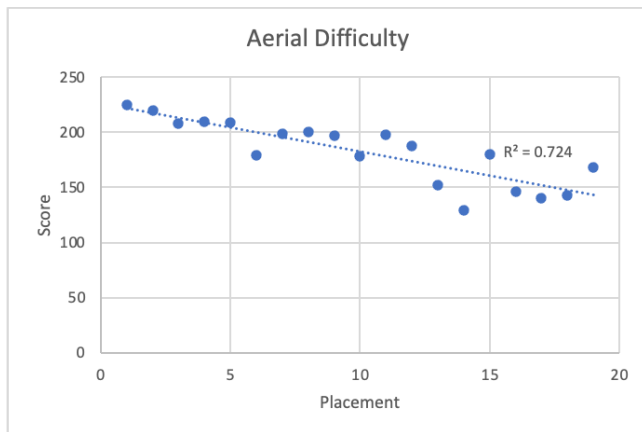


Figure 4

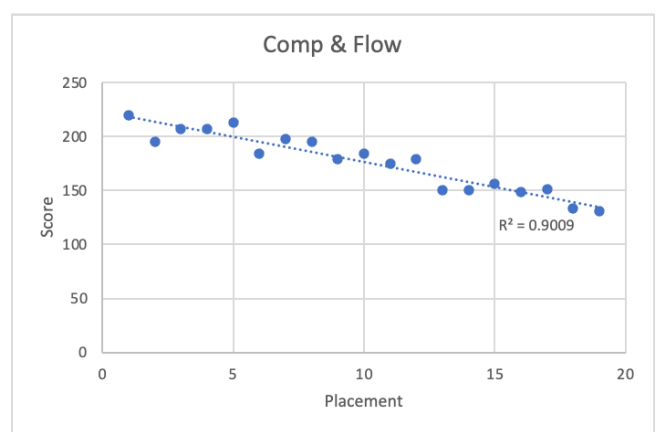


Figure 5

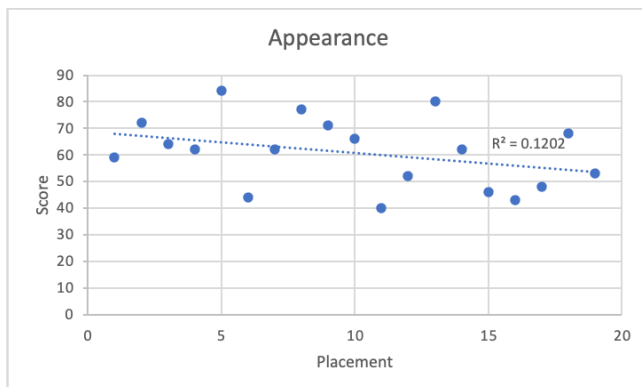


Figure 6

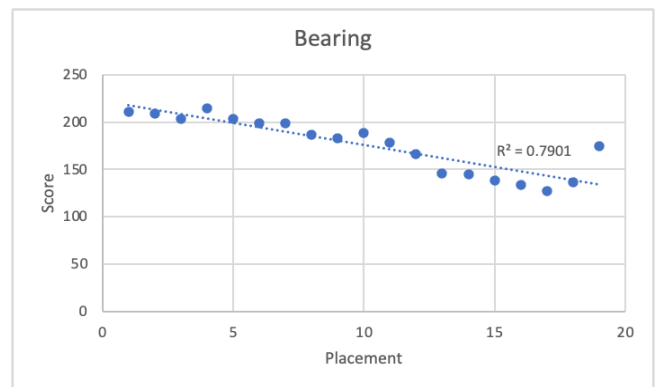


Figure 7

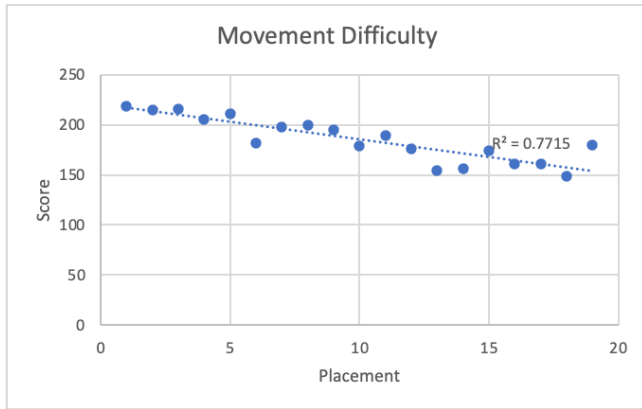


Figure 8

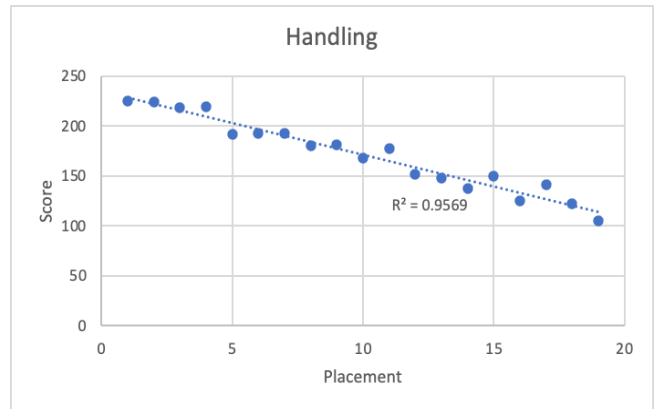


Figure 9

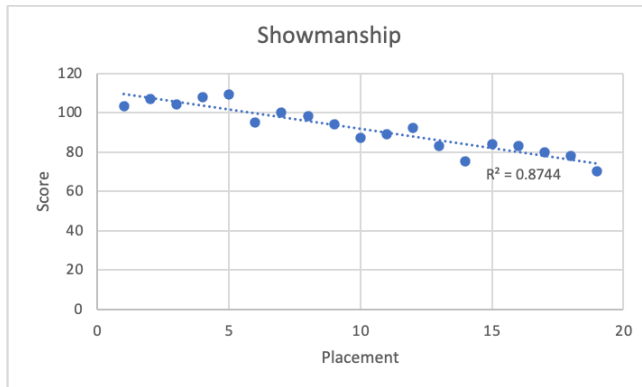


Figure 10

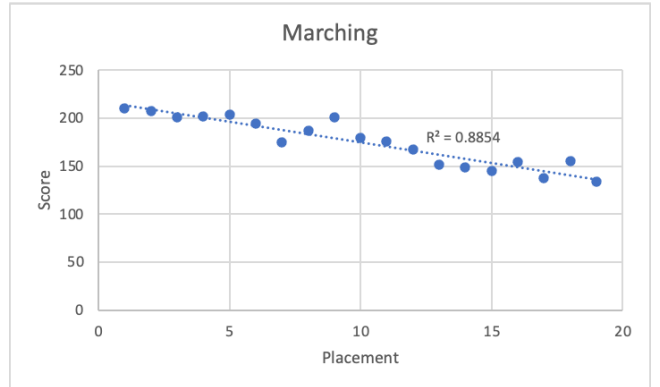


Figure 11

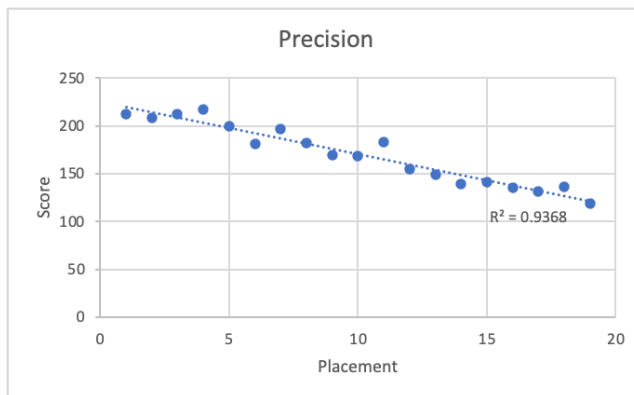


Figure 12

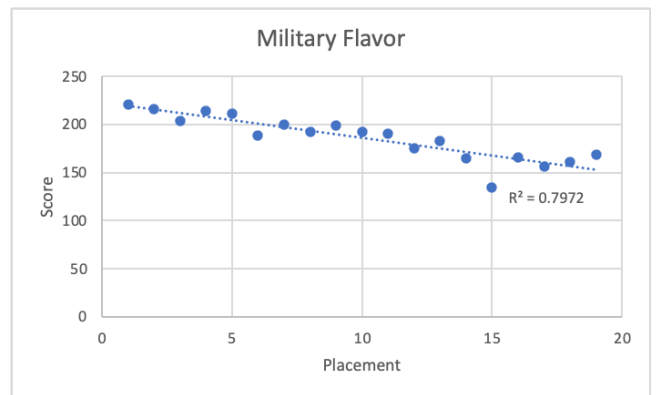


Figure 13

Table showing r values for the above figures (Table 1).

Category	Report in/out	Impression	Aerial Difficulty	Composition & Flow	Appearance	Bearing	Movement Difficulty	Handling	Showmanship	Marching	Precision	Military Flavor
r	0.81	0.96	0.85	0.95	0.35	0.89	0.88	0.98	0.94	0.94	0.97	0.89

Graphs for how strongly each judge’s total score for a competitor correlated with the competitor’s placement. For Figures 14 – 21 the x-axis is “Placement”, and the y-axis is “Score”.

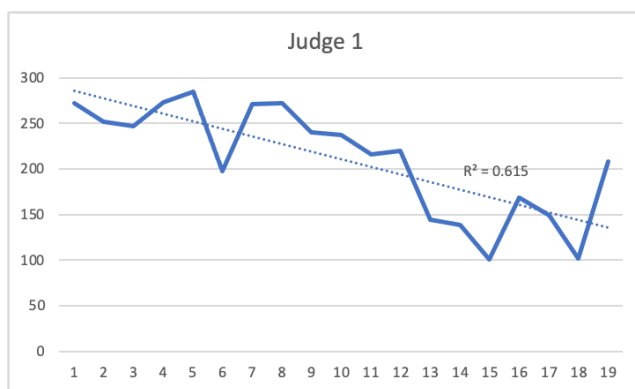


Figure 14

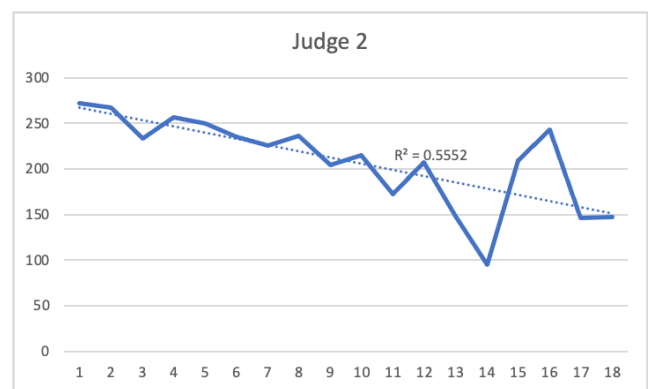


Figure 15

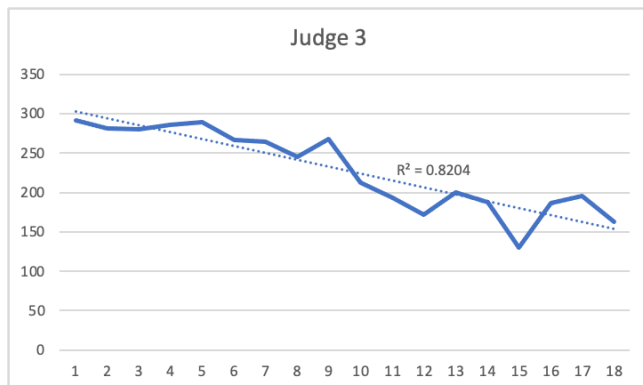


Figure 16

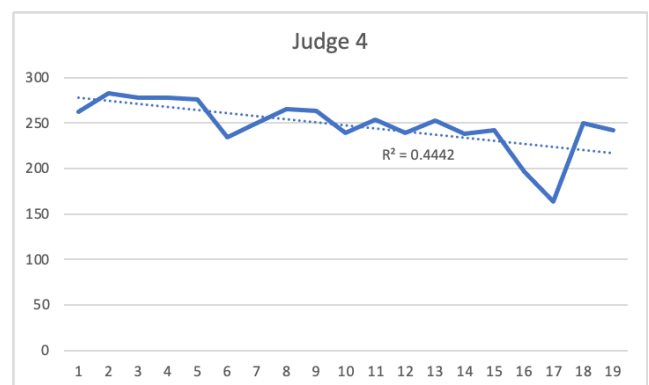


Figure 17

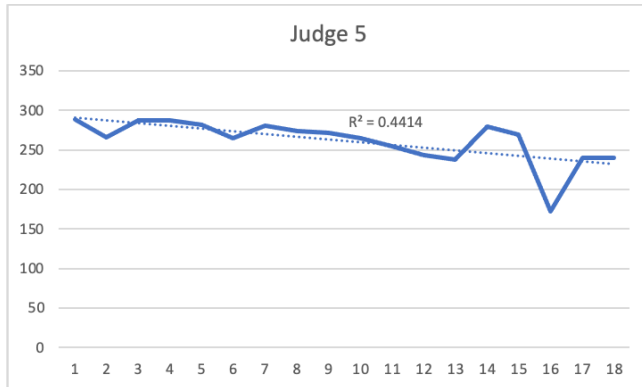


Figure 18

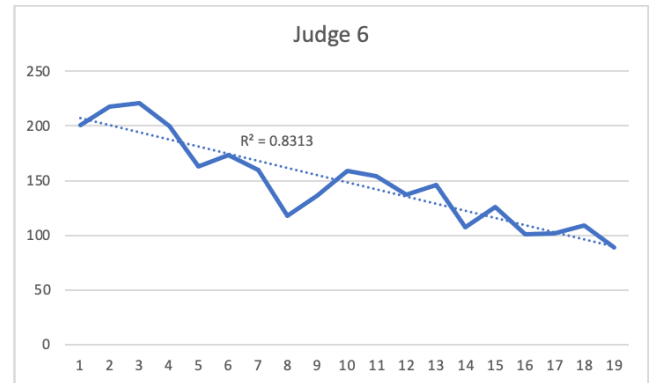


Figure 19

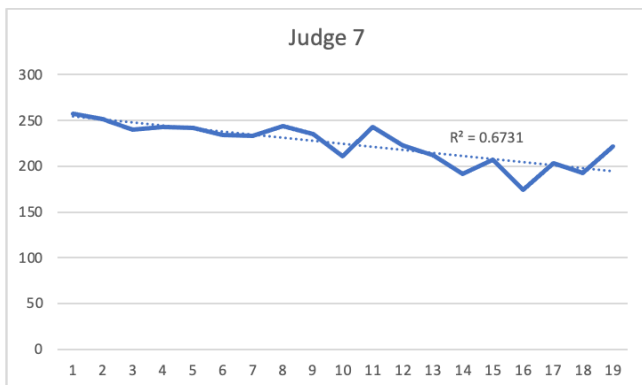


Figure 20

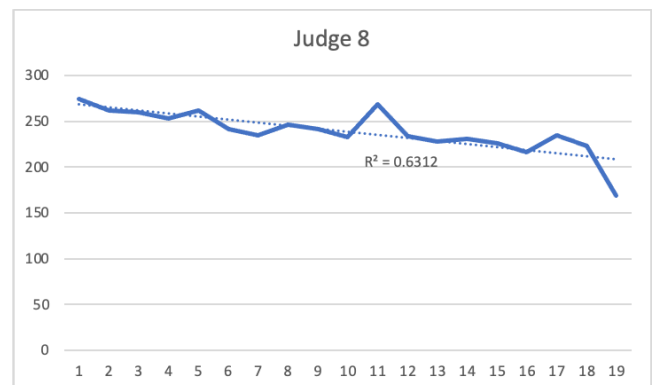


Figure 21

Table showing r values for the above figures. (Table 2)

Judge	1	2	3	4	5	6	7	8
r	0.78	0.75	0.91	0.67	0.66	0.91	0.82	0.79

Results

After creation of the graphs and r values, it was discovered that certain categories and certain judges did correlate more strongly with competitor placement.

Categories that correlated strongly with competitor placement were Impression, Composition and Flow, Handling, Showmanship, Marching, and Precision. The categories that had a medium correlation with competitor placement were Report In and Out, Bearing, Movement Difficulty, and Military Flavor. Only one category had a weak correlation with competitor placement, which was Appearance.

Only one judge correlated strongly with competitor placement, which was Judge 6. All other judges had a medium strength correlation with competitor placement.

Discussion

There are a number of conclusions that can be drawn from the data analysis in this paper, however, it is important to note the substantial number of limitations with the data. First, this is only a single data set and therefore it is very difficult to extrapolate any findings to other competitions. A single set of data cannot be considered representative. Second, the set-up of the Lone Star Championships is different than other competitions. This includes being set on a stage instead of on a typical "drill floor", judges were all Air Force servicemen instead of interservice, civilian, or a combination of all, it is outdoors instead of indoors, and appearance is

judged at the same time for all competitors. Third, other competitions utilize different Standard Operating Procedures or scoresheets.

Despite all of these limitations, there are some general ideas that could be drawn from the data. Should the patterns hold true across other competitions, competitors looking to craft a winning routine should focus more on the categories that correlate with higher placement such as Precision, Marching, and Showmanship. It is very telling that categories focused on by many such as the two Difficulty categories and Appearance were not strongly correlated to placement. This is in direct opposition to the “Scoresheet Overload” theory used by some of the top competitors, part of which states that you can impress the judges so much that your scores from the difficulty categories “bleed over” into other categories.

While judge identity was withheld for privacy reasons, it can be said that individual judges do correlate more strongly to a competitor’s placement than others. This means that some judges are more accurate at comparing a competitor to the overall but does not mean their scores impacted a competitor more than another judge.

There are many directions to take this analysis next, with possibly the most important being to continue collecting data from a large number of competitions to establish patterns and create a more representative set of data. This more representative set of data would help competitors

tailor their routines better towards their goals, whether that be winning or just putting on a good show.

Appendix

A. Full Data Set by Competitor

Placement	Report In/Repo	Team/Cadet I	Routine Comp	Overall Impre	Team/Cadet I	Team/Cadet I	Aerial Difficul	Movement Di	Movement Pr	Routine Show	Handling of H	Military Flavor	Penalties	Total (Individual Judge)	Penalties	Total
1	Judge 1	12	5	15	12	26	28	30	28	26	30	30		272		2118
	Judge 2	14	8	14	14	29	29	29	29	25	27	28		272		
	Judge 3	14	12	14	15	30	30	30	30	29	28	29		291		
	Judge 4	10	10	7	14	25	24	27	28	28	29	30		262		
	Judge 5	15	5	15	15	30	30	30	30	30	29	30		289		
	Judge 6	11	7	10	12	18	17	24	19	19	22	23		201		
	Judge 7	13	6	14	14	25	24	27	27	27	27	26		257		
	Judge 8	14	6	14	14	28	28	28	28	28	28	29		274		
		103	59	103	110	211	210	225	219	212	220	225	221			
2	Judge 1	12	11	14	14	25	23	27	30	24	16	30		252		2081
	Judge 2	12	8	13	13	26	26	29	29	28	26	29		267		
	Judge 3	11	9	13	15	30	29	30	29	29	28	28		30		
	Judge 4	14	13	15	15	27	29	27	28	28	27	30		283		
	Judge 5	13	10	13	13	28	24	30	24	25	26	30		266		
	Judge 6	13	7	12	11	21	23	22	22	21	21	23		218		
	Judge 7	12	7	14	13	26	27	27	26	26	24	27		252		
	Judge 8	13	7	13	14	26	26	28	27	27	27	27		262		
		100	72	107	108	209	207	220	215	208	195	224	216			
3	Judge 1	14	6	13	12	24	23	20	28	26	28	29		247		2046
	Judge 2	12	7	13	13	18	19	25	26	25	26	24		233		
	Judge 3	12	9	13	14	29	28	30	30	29	28	29		280		
	Judge 4	14	13	14	14	29	28	27	27	27	26	30		278		
	Judge 5	14	8	15	15	28	29	30	28	30	30	30		287		
	Judge 6	12	8	11	13	23	23	23	23	24	22	21		221		
	Judge 7	12	6	12	12	24	24	25	25	25	24	24		240		
	Judge 8	13	7	13	13	28	27	28	28	27	25	26		260		
		103	64	104	106	203	201	208	216	212	207	218	204			
4	Judge 1	15	8	13	14	25	24	29	27	28	30	30		273		2032
	Judge 2	13	10	14	14	26	26	24	25	29	23	29		257		
	Judge 3	15	6	15	14	29	29	30	30	30	29	29		286		
	Judge 4	14	13	14	14	30	27	25	26	29	29	29		278		
	Judge 5	15	5	15	15	30	28	29	30	30	30	30		287		
	Judge 6	11	7	11	12	23	20	21	18	19	17	19		200		
	Judge 7	13	7	13	13	25	24	24	25	25	25	26		243		
	Judge 8	14	6	13	12	27	24	28	24	27	24	27		253		
		110	62	108	108	215	202	210	205	217	207	219	214			
5	Judge 1	14	12	14	14	29	28	29	29	28	30	28		285		1999
	Judge 2	12	12	13	12	26	25	25	25	23	24	29		250		
	Judge 3	14	12	14	15	30	28	29	30	27	30	30		289		
	Judge 4	14	14	15	15	26	27	25	27	28	27	29		276		
	Judge 5	15	12	14	15	27	28	30	28	29	30	24		30		
	Judge 6	11	5	12	10	13	18	17	17	14	19	9		163		
	Judge 7	12	7	14	14	24	23	26	27	24	25	23		242		
	Judge 8	13	10	13	13	28	27	28	28	27	28	20		262		
		105	84	109	108	203	204	209	211	200	213	192	211			
6	Judge 1	15	6	9	12	24	24	8	12	19	20	26		198		1847
	Judge 2	13	5	13	13	26	24	24	23	20	24	26		235		
	Judge 3	15	6	12	14	29	29	26	26	30	24	28		257		
	Judge 4	14	3	12	13	25	25	24	24	23	24	23		234		
	Judge 5	13	8	14	13	29	24	28	29	25	24	28		265		
	Judge 6	11	4	11	11	16	21	21	19	14	18	17		173		
	Judge 7	12	7	12	13	23	23	24	24	24	24	25		234		
	Judge 8	13	5	12	12	27	24	24	24	25	24	26		241		
		106	44	95	101	199	194	179	182	181	184	193	189			
7	Judge 1	15	10	14	15	26	24	30	25	30	28	28		271		1805
	Judge 2	11	11	12	13	24	19	20	23	25	22	22		226		
	Judge 3	13	5	13	13	28	25	29	28	27	29	26		264		
	Judge 4	13	10	14	14	24	21	23	25	28	24	26		250		
	Judge 5	15	10	15	14	30	24	30	30	24	29	30		281		
	Judge 6	8	5	8	8	20	15	18	17	14	16	12		160		
	Judge 7	12	6	12	13	23	23	24	25	24	24	25		233		
	Judge 8	10	5	12	12	24	24	25	25	25	26	24		235		
		97	62	100	102	199	175	199	198	197	198	193	200			
8	Judge 1	15	11	13	14	26	24	28	30	27	30	26		272		1800
	Judge 2	12	12	13	12	23	22	25	25	23	22	24		236		
	Judge 3	13	14	12	12	25	24	24	25	25	24	23		245		
	Judge 4	15	12	13	14	26	25	26	27	26	28	27		265		
	Judge 5	15	5	14	14	28	25	30	29	28	28	28		274		
	Judge 6	6	7	8	5	10	16	15	12	8	13	6		118		
	Judge 7	14	8	12	14	22	24	27	27	23	25	24		244		
	Judge 8	14	8	13	13	27	27	25	25	22	25	22		246		
		104	77	98	98	187	187	200	200	182	195	180	192			
9	Judge 1	13	9	12	13	20	24	25	27	23	26	24		240		1759
	Judge 2	12	10	13	11	22	24	24	22	12	10	22		204		
	Judge 3	14	8	14	12	26	26	28	28	24	29	29		268		
	Judge 4	13	13	14	14	25	28	24	27	26	25	24		263		
	Judge 5	12	11	6	13	30	29	30	28	28	25	30		272		
	Judge 6	6	6	10	9	10	18	17	14	10	17	7		136		
	Judge 7	11	7	12	13	23	25	25	25	23	23	23		235		
	Judge 8	11	7	13	13	27	27	24	24	23	24	22		241		
		92	71	94	98	183	201	197	195	169	179	181	199			
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	Judge 2	12	4	12	13	24	22	21	22	19	20	22		215		
	Judge 3	15	6	11	12	24	24	22	22	18	24	15		212		
	Judge 4	12	12	6	12	24	24	23	22	23	24	24		239		
	Judge 5	12	11	12	12	30	30	24	25	27	24	28		265		
	Judge 6	8	8	6	9	17	12	20	19	10	20	13		159		
	Judge 7	10	8	12	12	22	20	20	20	23	22	20		211		
	Judge 8	11	8	12	12	24	24	24	24	23	24	23		233		
		86	66	87	95	189	179	178	179	168	184	168	192			

CORRELATIONS BETWEEN
CATEGORIES AND PLACEMENT:
LSC 2021

11	Judge 1	7	5	8	10	22	23	30	24	22	21	19	25	216		
	Judge 2	9	4	10	12	16	17	20	19	15	11	15	24	172		
	Judge 3	4	4	11	12	24	20	20	20	20	20	18	20	193		
	Judge 4	5	4	14	12	29	28	25	24	30	26	28	29	254	-110	1645
	Judge 5	11	5	14	13	24	23	28	29	24	25	29	30	255		
	Judge 6	6	4	7	8	11	14	21	19	19	18	14	13	154		
	Judge 7	10	7	12	13	25	24	26	26	26	26	26	22	243		
	Judge 8	13	7	13	14	27	27	28	28	27	28	28	28	268		
		65	40	89	94	178	176	198	189	183	175	177	191			
12	Judge 1	12	5	11	11	19	19	28	24	21	26	20	24	220		
	Judge 2	12	3	13	11	18	19	25	26	20	21	19	20	207		
	Judge 3	11	9	8	8	22	20	15	12	10	22	15	20	172		
	Judge 4	13	12	14	11	23	23	25	24	23	23	23	25	239	-50	1625
	Judge 5	12	5	12	12	24	24	28	23	23	24	26	30	243		
	Judge 6	5	7	10	8	12	14	16	15	13	16	9	12	137		
	Judge 7	11	5	12	12	23	24	25	26	22	23	20	20	223		
	Judge 8	11	6	12	13	25	24	26	26	23	24	20	24	234		
		87	52	92	86	166	167	188	176	155	179	152	175			
13	Judge 1	15	8	6	7	14	16	14	11	11	8	11	23	144		
	Judge 2	12	9	12	11	8	10	15	15	10	15	11	20	148		
	Judge 3	11	13	10	12	22	20	18	18	18	23	15	20	200		
	Judge 4	10	11	14	13	23	23	23	26	27	24	29	30	253	-50	1519
	Judge 5	11	12	11	11	24	23	23	23	23	23	24	30	238		
	Judge 6	6	12	7	8	12	11	13	14	15	14	18	16	146		
	Judge 7	11	8	11	12	20	23	22	23	22	20	20	20	212		
	Judge 8	11	7	12	12	23	25	24	24	23	23	20	24	228		
		87	80	83	86	146	151	152	154	149	150	148	183			
14	Judge 1	13	6	8	10	8	13	8	19	11	9	12	22	139		
	Judge 2	5	8	5	5	8	8	8	9	8	8	8	15	95		
	Judge 3	12	12	11	11	23	20	15	15	12	20	15	22	188		
	Judge 4	12	8	11	13	29	29	14	24	27	24	24	23	238	-50	1419
	Judge 5	14	8	14	14	26	26	30	30	29	28	30	30	279		
	Judge 6	5	7	6	7	7	9	10	14	10	15	8	9	107		
	Judge 7	10	8	9	9	20	20	18	18	20	20	20	20	192		
	Judge 8	10	5	11	12	24	24	26	27	22	26	20	24	231		
		81	62	75	81	145	149	129	156	139	150	137	165			
15	Judge 1	7	3	5	5	7	9	16	10	8	11	12	8	101		
	Judge 2	5	6	12	12	22	18	28	24	19	26	24	13	209		
	Judge 3	8	8	7	7	7	12	23	22	10	10	8	8	130		
	Judge 4	13	7	13	12	24	26	26	26	25	24	26	20	242	-100	1410
	Judge 5	14	5	14	13	26	24	29	28	28	28	30	30	269		
	Judge 6	11	3	10	9	8	10	13	17	10	14	9	12	126		
	Judge 7	10	7	11	11	20	22	21	23	21	20	21	20	207		
	Judge 8	12	7	12	12	24	24	24	24	20	23	20	24	226		
		80	46	84	81	138	145	180	174	141	156	150	135			
16	Judge 1	10	5	10	9	16	16	12	22	21	16	11	21	169		
	Judge 2	12	11	12	12	24	24	24	24	24	23	23	30	243		
	Judge 3	12	6	12	7	8	24	20	18	15	25	15	24	186		
	Judge 4	11	5	11	10	19	20	21	23	19	20	20	18	197	-50	1408
	Judge 5	10	3	11	10	19	16	22	20	10	17	15	19	172		
	Judge 6	7	4	8	9	5	9	9	16	6	11	7	10	101		
	Judge 7	9	4	8	11	23	22	14	14	20	15	14	20	174		
	Judge 8	13	5	11	10	20	23	24	24	20	22	20	24	216		
		84	43	83	78	134	154	146	161	135	149	125	166			
17	Judge 1	5	5	8	11	8	8	8	19	16	24	21	16	149		
	Judge 2	9	2	11	12	9	9	20	22	17	14	9	12	146		
	Judge 3	7	5	11	11	15	20	24	23	15	22	20	22	195		
	Judge 4	12	8	11	11	20	23	9	15	11	10	14	20	164	-50	1384
	Judge 5	12	11	12	11	23	24	24	24	23	23	23	30	240		
	Judge 6	8	5	5	8	6	8	10	12	6	13	10	11	102		
	Judge 7	10	6	10	10	20	21	21	22	20	21	21	21	203		
	Judge 8	13	6	12	12	26	24	24	24	23	24	23	24	235		
		76	48	80	86	127	137	140	161	131	151	141	156			
18	Judge 1	13	6	6	6	9	8	7	8	7	8	8	16	102		
	Judge 2	10	12	9	9	21	15	18	15	10	8	8	12	147		
	Judge 3	6	10	10	6	7	28	15	20	15	18	10	18	163		
	Judge 4	11	11	12	12	24	25	25	25	28	24	25	28	250	-100	1327
	Judge 5	11	11	12	11	24	24	23	24	24	23	23	30	240		
	Judge 6	4	6	6	6	8	11	11	13	12	11	8	13	109		
	Judge 7	10	6	11	10	20	20	20	20	18	18	20	20	193		
	Judge 8	10	6	12	11	23	24	24	24	22	23	20	24	223		
		75	68	78	71	136	155	143	149	136	133	122	161			
19	Judge 1	12	11	5	10	24	11	26	26	21	24	15	23	208		
	Judge 2	12	6	5	11	24	11	26	26	21	24	15	23	204		
	Judge 3	12	6	5	11	24	20	20	23	8	8	8	20	165		
	Judge 4	10	5	10	14	26	23	28	25	24	25	25	27	242	-200	1267
	Judge 5	9	5	11	8	23	20	15	24	10	10	9	24	168		
	Judge 6	6	6	9	6	6	9	10	10	7	6	5	9	89		
	Judge 7	10	6	14	14	25	20	23	23	20	24	20	23	222		
	Judge 8	11	8	11	7	23	20	20	23	8	10	8	20	169		
		82	53	70	81	175	134	168	180	119	131	105	169			

CORRELATIONS BETWEEN
 CATEGORIES AND PLACEMENT:
 LSC 2021

B. Total Judge Score by Competitor

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Judge 1	272	252	247	273	285	198	271	272	240	237	216	220	144	139	101	169	149	102	208
Judge 2	272	267	233	257	250	235	226	236	204	215	172	207	148	95	209	243	146	147	204
Judge 3	291	281	280	286	289	267	264	245	268	212	193	172	200	188	130	186	195	163	165
Judge 4	262	283	278	278	276	234	250	265	263	239	254	239	253	238	242	197	164	250	242
Judge 5	289	266	287	287	282	265	281	274	272	265	255	243	238	279	269	172	240	240	168
Judge 6	201	218	221	200	163	173	160	118	136	159	154	137	146	107	126	101	102	109	89
Judge 7	257	252	240	243	242	234	233	244	235	211	243	223	212	192	207	174	203	193	222
Judge 8	274	262	260	253	262	241	235	246	241	233	268	234	228	231	226	216	235	223	169