

2018 BGG New Year's Resolution:  
A Year-Long Study of Boardgaming and Internal Body Temperature  
by  
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Note:

A special thanks to all willing and unwilling opponents and gaming allies who helped provide feedback, guidance, constructive criticism, and a special measure of patience during the many games we played to gather data for this project. New Year's Resolutions are often difficult to maintain momentum but you helped turn this crazy dream into a reality. The boardgaming and scientific communities are all the better for your not insignificant contributions.

### Abstract

The goal of the project was to examine the effects of boardgaming on internal body temperature. Specifically, my own internal body temperature. Data was gathered by recording initial temperature readings at the start of each gaming session. Further readings were made at the completion of each game played during the 2018 calendar year. Opponents and scores were also recorded in order to broaden the data set and search for additional trends or correlation. The initial hypothesis was that my rating for a game on the BGG scale (1-10) could be correlated to my internal body temperature.

*Keywords:* Temperature, BGG, oral, games, gaming, opponent, winner, loser, dork, beeping, rating, nerd, thermometer, statistics, resolution.

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2018 BGG New Year's Resolution:

A Year-Long Study of Boardgaming and Internal Body Temperature

## 1. Equipment

The following pieces of equipment were essential to gathering data for this study:

- Pilot Precise V5 Rolling Ball Fine Point Pen (made in Japan)
- 3.5x5.5" Moleskine Journal with lined pages and a rear pouch
- Oral Thermometer (Vicks ComfortFlex Digital, model V966US) with manufacturer's specified tolerance of  $\pm 0.2$  °F. <sup>\*,1</sup>
- (3) Batteries, Duracell CR1225
- Microsoft Excel – Office 365 Edition with Analysis ToolPak

\* note: The oral thermometer type was selected over rectal not only for convenience at the game table but also because it tastes better.

## 2. Raw Data

The following pieces of raw data were gathered over the course of the 2018 calendar year: Date, Location, Game Title, Game Rating (my rating), Temperature (measured once at the start of each session and once at the end of each game), Win/Loss/Tie, My Score, # of Players, Winner, and each Opponent's Score. Co-op and solo game status was also documented for exclusion from certain calculations, such as the RWF (see Sec. 4).

This data was recorded for every game played in 2018. Well, 99.9% of the games played. I did forget my thermometer and journal at Dave Vander Ark's one time in the spring. That was the night we played a 6-player game of Power Grid (Russia map) and I won. Man, it would have been nice to have that data point but it probably won't have changed the numbers very much since there is already so much data.

Select raw data columns are shown in Table 1 at the end of this report for convenience with independent verification of results.

### 3. Statistical Results

The following statistical results were calculated from the full set of data:

$$\text{AVERAGE} = 97.68 \text{ }^{\circ}\text{F}$$

$$\text{Standard Deviation} = 0.34 \text{ }^{\circ}\text{F}$$

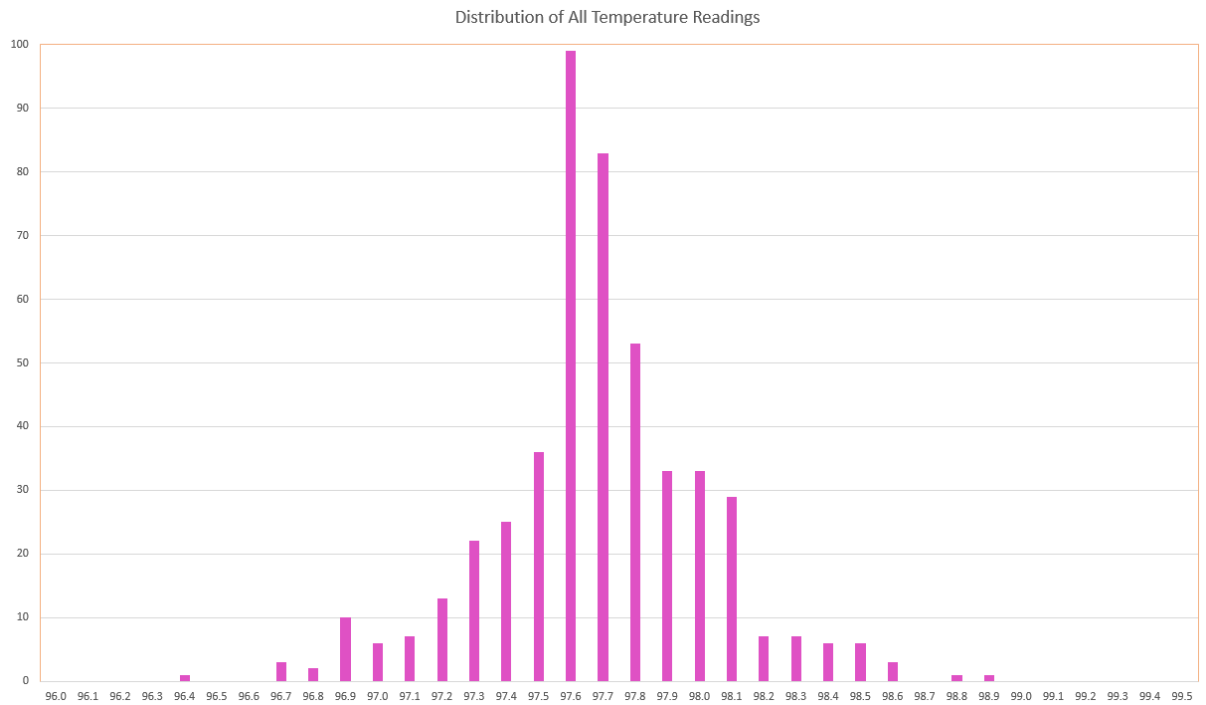
$$\text{Median} = 97.7 \text{ }^{\circ}\text{F}$$

$$\text{Max} = 98.9 \text{ }^{\circ}\text{F}$$

$$\text{Min} = 96.4 \text{ }^{\circ}\text{F}$$

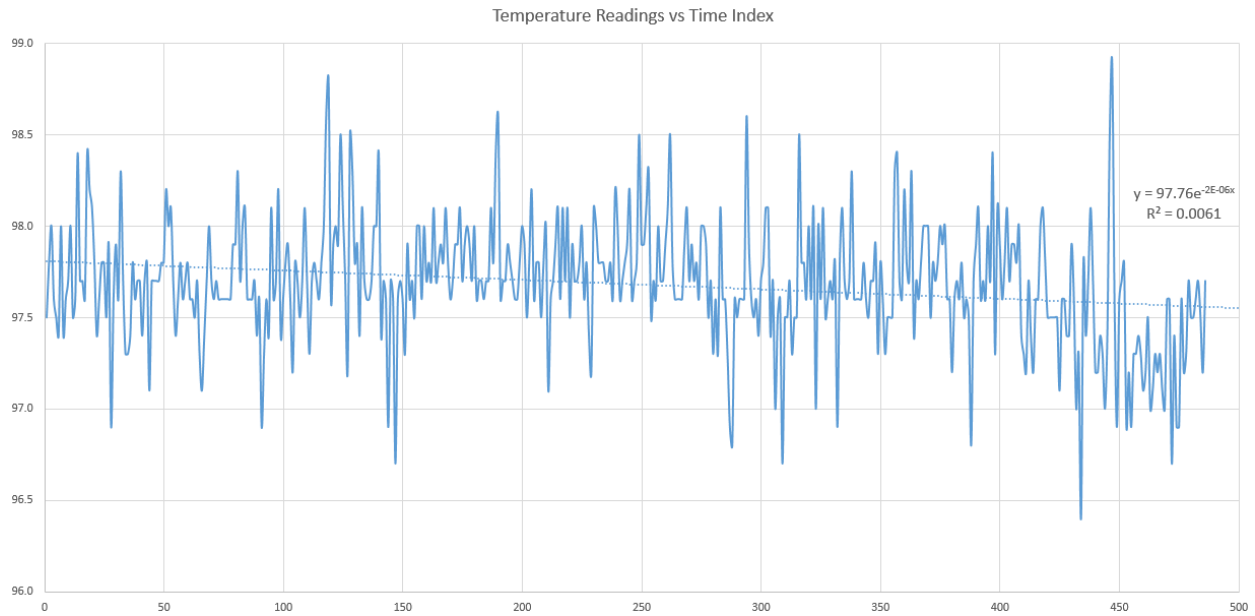
$$\text{Range} = 2.5 \text{ }^{\circ}\text{F}$$

The histogram of readings in Fig. 1a displays a typical Gaussian distribution with a nicely shaped bell curve.



*Fig. 1a.* Histogram

Additionally, I tracked my temperature trend over time in Figure 1b. The negative slope for the curve fit (dashed line) indicates that either my thermometer is dying or I am.



*Fig. 1b.* Temperature Readings vs time (with curve fit)

#### 4. Effects of Winning or Losing

373 total plays were logged in this study. 112 wins, 8 ties, and 253 losses, which yields a win percentage of 32.17%. Fig. 2 shows the averaged effects of winning or losing. From this, it is scientifically proven that winning feels good, losing sucks, but nothing is worse than a tie.

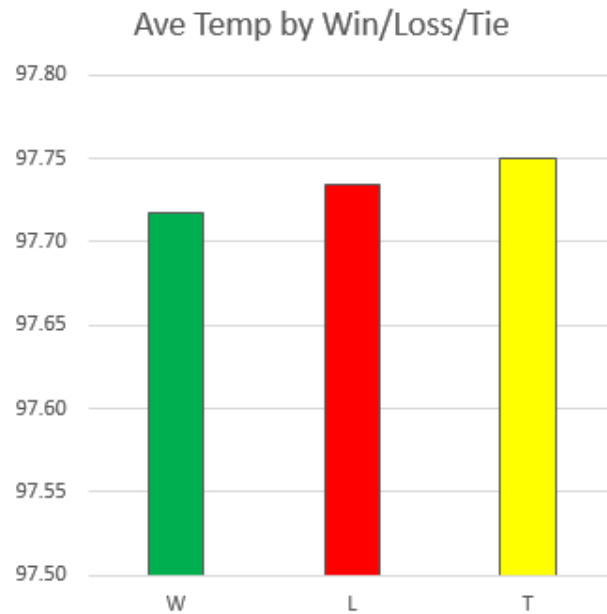


Fig. 2. Effects of Winning or Losing

Fig. 3 shows the RWF (Reynier Win Factor) which is a method derived to track winning and losing streaks over time as well as overall gamer performance. Starting at a nominal score of zero,  $(n-1)/n$  points are cumulatively awarded for a win and  $1/n$  points are cumulatively subtracted for a loss, where  $n$  is the number of players in a game. My RWF versus time clearly highlights certain streaks (like summer break or Christmas break). It also shows that there were times during the year where I was a winner but ultimately at year's end I was a loser.





Fig. 3. Reynier Win Factor (RWF) plotted versus time

### 5. Correlation to Game Rating

The average temperature for my game ratings (1-10 scale) are shown in Fig. 4. It is plainly evident that there is no correlation between a game's rating and my internal body temperature, which is one of the key results from this study. I was also able to track the number of plays for each game rating as shown in Fig 5. Again, we see a nice normal distribution indicating that I get to play a lot of 7's, sometimes play games that I love (9 or 10), and rarely play games that I hate (4 or less).

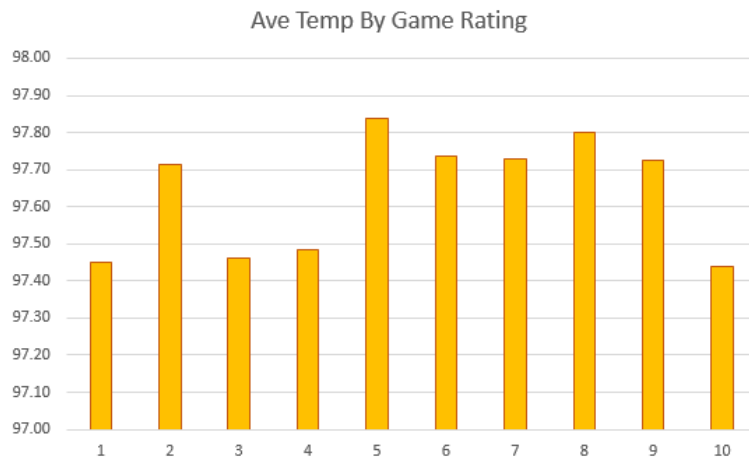


Fig. 4.

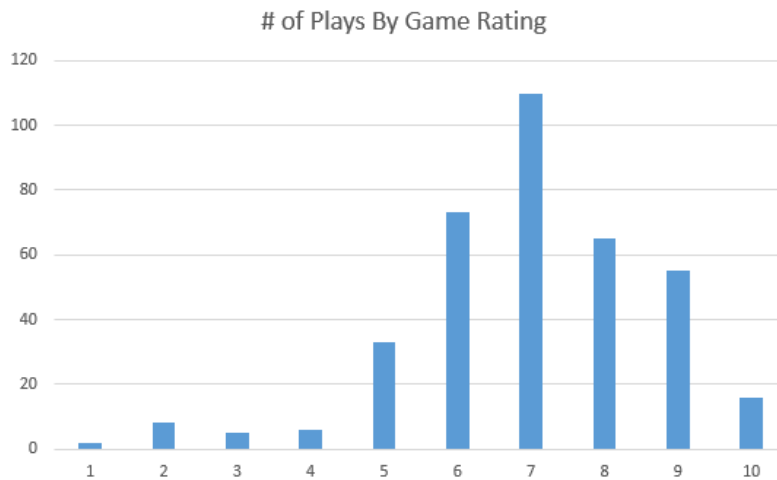


Fig. 5.

## 6. Correlation to Player Count

Furthermore, there appears to be no correlation between player count and my internal body temperature. This result was somewhat expected. 4-player games are the most common for me, followed by 2-player games. This also isn't too surprising.

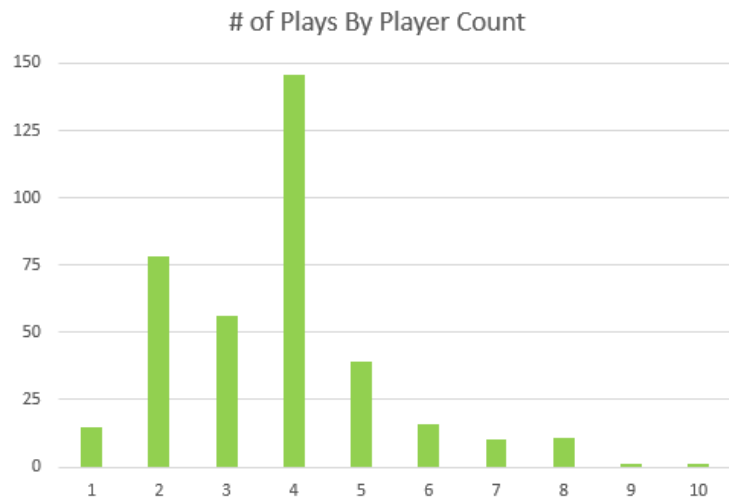


Fig. 6.

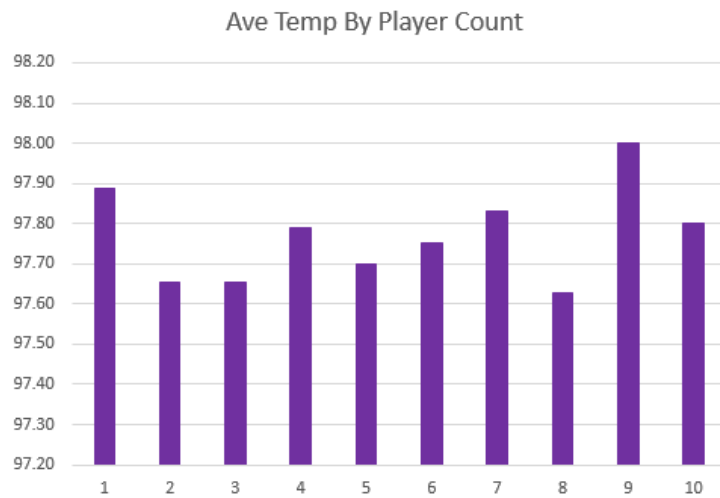
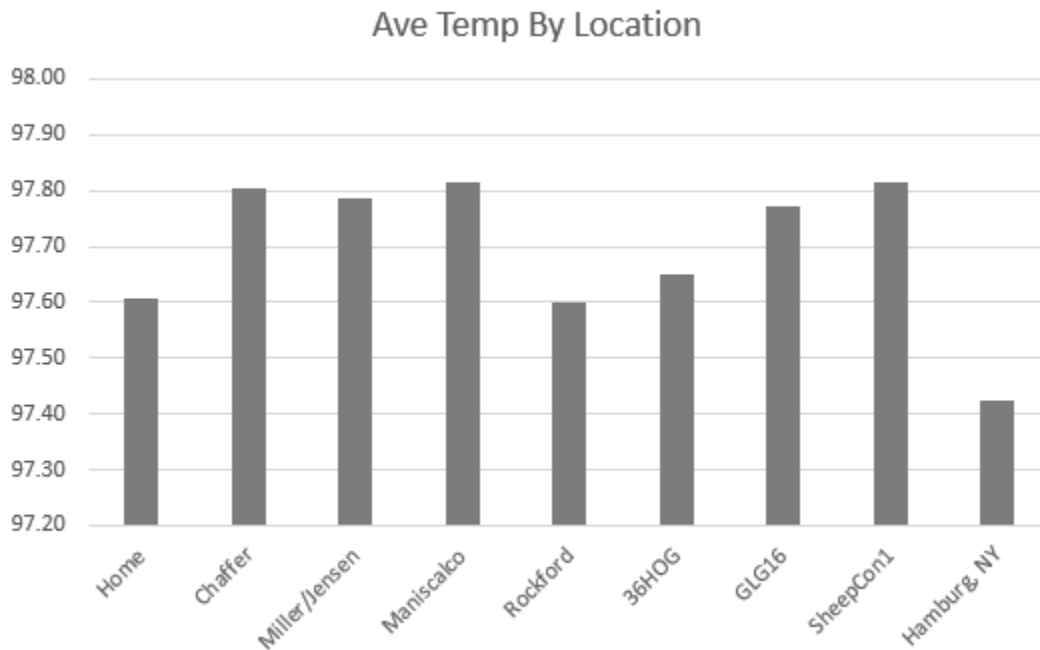


Fig. 7

### 7. Correlation to Location and Environment

Locations at which I played at least 2 games were included in the calculation shown below in Fig. 8. These results are difficult to interpret. There could be some variation with the seasons, geography, atmospheric pressure, elevation above sea level, home owner's preferences and/or ambient temperature. Further research is perhaps warranted in this area.



*Fig. 8.* Average Temperature by Location

### 8. Correlation to Opponents

One of the most revelatory results from the study is the effect of who wins a game on my temperature. Only opponents who won at least 2 games against me were factored into the calculations, so if you don't see your name here it simply means that you didn't defeat me enough. I didn't expect some of these but the numbers don't lie. The Top 5 Opponents who really made my blood boil in 2018 were:

1. Jarchow – 98.01 °F
2. Sebastian – 97.95 °F
3. Jonathan – 97.89 °F
4. Tony – 97.86 °F
5. Mark H – 97.85 °F

On the flip side, it seems that I'm perfectly content to lose games to Kamryn or Lanette. In fact, it makes me feel rather chill. And, furthermore, there has probably never been a more scientific and mathematical proof of true love!

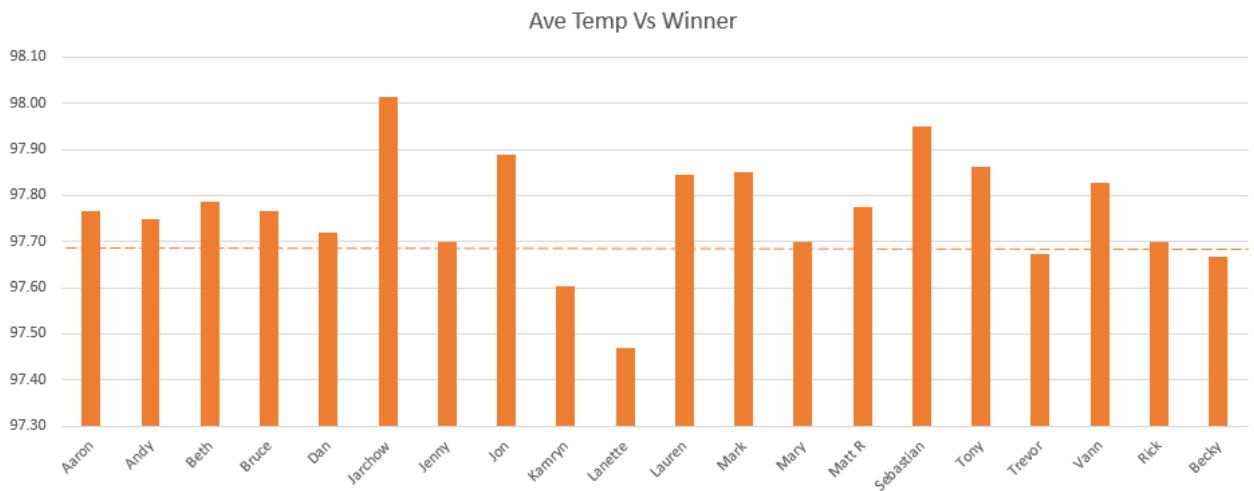


Fig. 9. Average Temperature vs. Game Winner

## 9. Final Conclusions

In summary, this study has conclusively revealed the following:

- There is no correlation between my rating for a game and my internal body temperature.
- There is correlation between my temperature and who defeats me.
- Winning a game feels good, losing sucks, but nothing is worse than a tie.

## 10. Opportunities for Further Research

Further research could potentially be done to examine the effects of location and ambient conditions. The data that was gathered shows a fair amount of variation with location that cannot be explained alone from the information recorded.

Temperature is just one of our vital statistics as human beings. An obvious extension of this work would be to examine the effects of gaming on other vital statistics such as blood pressure, heart rate, pupil dilation, etc. This is fertile soil for future research. I am gifting those opportunities to the GRAB members, BGG community, and the scientific community at large.

### References

Blatteis, Clark M, ed. (2001) [First published 1998]. *Physiology and Pathophysiology of Temperature Regulation*. Singapore & River Edge, NJ: World Scientific Publishing Co.

Buss, D. M., & Shackelford, T. K. (1997). Human aggression in evolutionary psychological perspective. *Clinical psychology review, 17*(6), 605-619.

Kiyatkin, E. A. (2007). Brain temperature fluctuations during physiological and pathological conditions. *European Journal of Applied Physiology, 101*(1), 3-17.

doi:10.1007/s00421-007-0450-7

*Excerpt: Human Body Extremes*. Guinness World Records. 2004.

<http://www.boardgamegeek.com/user/droppecho>

### Footnotes

<sup>1</sup> There has been some debate about the effect of the thermometer tolerance on the temperature readings and subsequent interpretation of results. While further study in this area is perhaps of some interest, it would be against the spirit and resolve of this study to discount the findings based on such minutia. The thermometer could be calibrated using exhaustive laboratory experiments and would, almost certainly, be found to have a much tighter tolerance than that which is specified by the manufacturer. It is reasonable to assume for purposes of this study that the tolerance is factually much, much tighter than the manufacturer's published value of +/- 0.2 °F. Probably 10x tighter. At least. The manufacturer is simply covering their butts with a huge tolerance for legal reasons so that they cannot be sued in a life or death situation.

<sup>2</sup> The traditional average human body temperature of 98.6 °F appears to be malarkey. Either that or I'm just cooler than average.



## Tables

Table 1: Raw Temperature Data recorded from 01Jan2018 thru 31Dec2018.

Index	Game	TEMP (F)			
1	INIT	97.5	64	Maskmen	97.7
2	Word Slam	97.8	65	INIT	97.3
3	NMBR9	98.0	66	Bunny Kingdom	97.1
4	Azul	97.6	67	INIT	97.4
5	Vast: The Fearsome Foes	97.5	68	El Dorado	97.7
6	Circus Flohcati	97.4	69	Montage	98.0
7	Circus Flohcati	98.0	70	11 Nimmt!	97.7
8	Cosmic Encounter	97.4	71	INIT	97.6
9	INIT	97.6	72	Gloomhaven	97.7
10	Ora Et Labora	97.7	73	Sentient	97.6
11	Cottage Garden	98.0	74	INIT	97.6
12	INIT	97.5	75	Ticket To Ride: France	97.6
13	Race For The Galaxy	97.6	76	Shadespire	97.6
14	Race For The Galaxy	98.4	77	Shadespire	97.6
15	Bob Ross: Art Of Chill	97.7	78	INIT	97.6
16	INIT	97.7	79	Gloomhaven	97.9
17	Race For The Galaxy	97.6	80	Quadropolis	97.9
18	INIT	98.4	81	Pocket Ops	98.3
19	Jump Drive	98.2	82	Ethnos	97.7
20	Jump Drive	98.1	83	Codenames	98.0
21	Citadels	97.8	84	Codenames	98.1
22	Ulm	97.4	85	INIT	97.6
23	Trickster: Champions Of Time	97.6	86	Patchwork	97.6
24	INIT	97.8	87	INIT	97.6
25	Settlers Of Catan	97.8	88	Manhattan	97.7
26	INIT	97.5	89	Shogun	97.4
27	Botswana	97.9	90	Bang! The Dice Game	97.6
28	Cosmic Encounter	96.9	91	INIT	96.9
29	Zendo	97.6	92	Koala	97.3
30	Tichu	97.9	93	Donought Drive-Thru	97.6
31	INIT	97.6	94	Witness	97.4
32	Gloomhaven	98.3	95	11 Nimmt!	98.1
33	Gloomhaven	97.7	96	Bunny Kingdom	97.6
34	INIT	97.3	97	Mucho Macho	97.7
35	Alien Artifacts	97.3	98	On The Dot	98.2
36	Alien Artifacts	97.4	99	Witness	97.4
37	INIT	97.8	100	INIT	97.6
38	Codenames	97.6	101	Ethnos	97.8
39	Codenames	97.7	102	Sagrada	97.9
40	Sentient	97.7	103	Ra	97.6
41	Thingamajig	97.4	104	INIT	97.2
42	TMNT: Shadows Of The Past	97.7	105	Hey! That's My Fish	97.8
43	Shadespire	97.8	106	Monopoly Deal	97.7
44	INIT	97.1	107	INIT	97.5
45	Ticket To Ride: Old West	97.7	108	Gloomhaven	97.7
46	INIT	97.7	109	Sushi Go Party	98.1
47	High Society	97.7	110	7 Wonders	97.7
48	Via Nebula	97.7	111	INIT	97.3
49	Blue Moon City	97.8	112	Mission: Red Planet	97.7
50	INIT	97.8	113	Pack And Stack	97.8
51	Alien Artifacts	98.2	114	Mascarade	97.7
52	Was Sticht?	98.0	115	Shadespire	97.6
53	Glass Road	98.1	116	Shadespire	97.8
54	INIT	97.7	117	INIT	98.0
55	Santorini	97.4	118	Onirim	98.6
56	Santorini	97.6	119	Onirim	98.8
57	Santorini	97.8	120	INIT	97.6
58	INIT	97.6	121	Las Vegas Boulevard	97.9
59	Noria	97.7	122	Tichu	98.0
60	Frank's Zoo	97.8	123	Vast	97.9
61	INIT	97.6	124	INIT	98.5
62	To Court The King	97.6	125	Onirim	98.1
63	Circus Flohcati	97.5	126	INIT	97.7
			127	Elfenroads	97.2
			128	Cacao	98.5

129	Fox In The Forest	98.3	194	INIT	97.9
130	Hanamakoji	97.8	195	Twilight Struggle	97.8
131	Hanamakoji	97.9	196	INIT	97.7
132	INIT	97.4	197	Qwinto	97.6
133	Fox In The Forest	98.1	198	No Thanks!	97.6
134	Duel In The Dark	97.7	199	Decrypto	97.8
135	Cacao	97.6	200	Decrypto	98.0
136	INIT	97.6	201	Fabled Fruit	97.9
137	Elfenroads	97.7	202	INIT	97.5
138	INIT	98.0	203	Shadespire	97.8
139	Decrypto	98.0	204	INIT	98.2
140	Pioneer Days	98.4	205	Five Tribes	97.6
141	INIT	97.4	206	Queendomino	97.8
142	Fox In The Forest	97.7	207	Raptor	97.8
143	Fox In The Forest	97.6	208	INIT	97.5
144	Loopin' Chewie	96.9	209	Gloomhaven	97.8
145	Dixit	97.7	210	Gloomhaven	98.0
146	Chomp!	97.6	211	INIT	97.1
147	Ringo Flamingo	96.7	212	Lost Cities: The Board Game	97.6
148	King's Breakfast	97.6	213	INIT	97.7
149	Sorry Sliders	97.7	214	Shadespire	97.9
150	Too Many Cinderellas	97.6	215	7 Wonders	98.1
151	INIT	97.3	216	INIT	97.6
152	Go Nuts For Donuts	97.9	217	Gloomhaven	98.1
153	Go Nuts For Donuts	97.6	218	Adel Verpflichtet	97.7
154	Rhino Hero: Super Battle	97.7	219	Too Many Cinderellas	98.1
155	INIT	97.5	220	Diamant!	97.5
156	Fox In The Forest	98.0	221	King's Breakfast	97.9
157	Magic The Gathering	98.0	222	INIT	97.7
158	INIT	97.6	223	Shadespire	97.7
159	Wurfel Bohnanza	98.0	224	INIT	97.8
160	Mystery Rummy	97.7	225	Seasons	98.0
161	Magic The Gathering	97.8	226	INIT	97.6
162	INIT	97.7	227	Space Hulk	97.8
163	Elfenroads	98.1	228	INIT	97.4
164	Decrypto	97.7	229	Isle Of Skye	97.2
165	Decrypto	97.8	230	Flamme Rouge	98.1
166	TMNT: Shadows Of The Past	97.9	231	Favor Of The Pharaoh	98.0
167	TMNT: Shadows Of The Past	97.8	232	Qwixx Gemixxt	97.8
168	Winner's Circle	98.1	233	INIT	97.8
169	Unpublished Prototype	97.8	234	TMNT: Shadows Of The Past	97.8
170	INIT	97.6	235	INIT	97.7
171	Alien Artifacts	97.7	236	Star Wars Miniatures	97.7
172	INIT	97.9	237	Shadespire	97.8
173	Small World	97.9	238	INIT	97.6
174	Fabled Fruit	98.1	239	Manila	98.2
175	Visitor	97.7	240	Airships	98.0
176	Qwinto	97.9	241	Felix: The Cat In The Sack	97.6
177	No Thanks!	98.0	242	Foppen	97.7
178	INIT	97.9	243	INIT	97.8
179	Itzi	97.7	244	Factory Funner	97.9
180	Itzi	98.0	245	Ticket To Ride: Old West	98.2
181	Itzi	97.6	246	INIT	97.6
182	Unspeakable Words	97.7	247	Archaeology	97.7
183	Shadespire	97.7	248	Bohnanza: Ladies	97.8
184	INIT	97.6	249	INIT	98.5
185	Ticket To Ride	97.7	250	Bohnanza: Plus!	97.9
186	Qwinto	97.7	251	Witness	97.9
187	Qwinto	98.1	252	Decrypto	98.1
188	INIT	97.8	253	Web Of Power	98.3
189	Small World	98.4	254	INIT	97.5
190	Bigfoot Vs. Yeti	98.6	255	Fox In The Forest	97.7
191	Decrypto	97.6	256	INIT	97.6
192	INIT	97.7	257	Gloomhaven	98.0
193	Bunny Kingdom	97.7	258	Gloomhaven	97.7

259	INIT	97.7		Agricola: All Creatures Big	
260	Azul	97.9	324	and Small	98.0
261	11 Nimmt!	98.1	325	INIT	97.6
262	Castles Of Burgundy	98.5	326	Brass: Birmingham	98.1
263	Senshi	97.8	327	INIT	97.5
264	INIT	97.6		Agricola: All Creatures Big	
265	Vast	97.6	328	and Small	97.6
266	INIT	97.6	329	Magic The Gathering	97.7
267	Bunny Kingdom	97.6	330	Magic The Gathering	97.6
268	Potato Man	97.9	331	Magic The Gathering	97.8
269	That's Life	98.1	332	INIT	96.9
270	Great Western Trail	97.7	333	Shadespire	97.8
271	INIT	97.9	334	7 Wonders: Duel	98.1
272	High Society	97.7	335	Magic The Gathering	97.7
273	Sentient	97.8	336	INIT	97.6
274	Visitor	97.6	337	Photosynthesis	97.7
275	Decrypto	98.0	338	Palm Island	98.3
276	Web Of Power	98.0	339	El Grande	97.6
277	INIT	97.9	340	INIT	97.6
278	TTR New York	97.5	341	TTR Asia	97.6
279	Decrypto	97.7	342	The Pyramid's Deadline	97.6
280	Qwinto	97.3	343	Root	97.8
281	Fox In The Forest	97.6	344	INIT	97.6
282	Archaeology	97.3	345	Finca	97.5
283	TTR New York	98.1	346	Roll Player	97.7
284	Qwinto	97.6	347	Unspeakable Words	97.7
285	Qwinto	97.6	348	Rise Of Augustus	97.9
286	INIT	97.3	349	INIT	97.3
287	Decrypto	96.9	350	Gloomhaven	97.8
288	INIT	96.8	351	Gloomhaven	97.6
289	Qwinto	97.6	352	INIT	97.3
290	Fabled Fruit	97.5	353	Barenpark	97.5
291	Decrypto	97.6	354	To Court The King	97.5
292	INIT	97.6	355	INIT	97.5
293	Heaven & Ale	97.6	356	Asara	98.3
294	Gardens	98.6	357	Notre Dame	98.4
295	INIT	97.9	358	Archaeology	97.7
296	7 Wonders Duel	97.6	359	INIT	97.6
297	INIT	97.5	360	Witness	98.2
298	Qwinto	97.6	361	Witness	97.8
299	Qwinto	97.4	362	Via Nebula	97.7
300	Qwinto	97.7	363	Cosmic Eidex	98.3
301	INIT	97.8	364	Reef	97.4
302	Gloomhaven	98.1	365	Blitz Bowl	97.7
303	Qwinto	98.1	366	INIT	97.6
304	Qwinto	97.4	367	Cribbage	97.8
305	Bang: The Dice Game	97.7	368	Santorini	98.0
306	INIT	97.0	369	Santorini	98.0
307	Qwinto	97.5	370	Santorini	98.0
308	Qwinto	97.6	371	INIT	97.5
309	INIT	96.7		Agricola: All Creatures Big	
310	Queendomino	97.5	372	and Small	97.8
311	INIT	97.5	373	Feeling Sheepish	97.7
312	Root	97.7	374	Feeling Sheepish	97.8
313	Init	97.3	375	Shear Panic	98.0
314	Hidden Panda	97.5	376	Fabled Fruit	97.9
315	Hidden Panda	97.5	377	Isle Of Skye	98.0
316	Railroad Ink	98.5	378	INIT	97.6
317	Root	97.8	379	Reef	97.6
318	Around The World In 80 Days	97.8	380	INIT	97.2
319	INIT	97.6	381	Reef	97.6
320	Root	98.0	382	Reef	97.7
321	Gizmos	97.6	383	Atlantic Star	97.6
322	Maskmen	98.1	384	Diamant!	97.8
323	INIT	97.0	385	INIT	97.5

386	Gloomhaven	97.6	451	Foppen	97.7
387	Gloomhaven	97.5	452	Fairy Tile	97.8
388	INIT	96.8	453	Ethnos	96.9
389	Lifestyle	97.7	454	INIT	97.2
390	Monster Crunch	97.9	455	Terminal Directive	96.9
391	Villainous	98.1	456	Terminal Directive	97.3
392	Mesozoic	97.6	457	Terminal Directive	97.3
393	Texas Showdown	97.7	458	Fire & Axe	97.4
394	Reef	97.6	459	Terminal Directive	97.3
395	Monster Crunch	98.0	460	Terminal Directive	97.1
396	Drop It	97.7	461	INIT	97.2
397	Root	98.4	462	KeyForge	97.5
398	Reef	97.3	463	KeyForge	97.0
399	Texas Showdown	98.1	464	Cryptid	97.1
400	Century Eastern Wonders	97.9	465	Cryptid	97.3
401	Cryptid	97.6	466	Root	97.2
402	Blitz Bowl	97.8	467	KeyForge	97.3
403	Blue Moon City	98.1	468	INIT	97.1
404	Drop It	97.7	469	Magic The Gathering	97.0
405	Petrichor	97.9	470	Terminal Directive	97.6
406	Cryptid	97.9	471	Terminal Directive	97.6
407	Cryptid	97.8	472	Seasons	96.7
408	My Little Scythe	98.0	473	INIT	97.4
409	Quest for El Dorado	97.4	474	Royal Turf	96.9
410	INIT	97.3	475	Dominant Species	96.9
411	Tic-Tac-Toe	97.2	476	INIT	97.6
412	Tic-Tac-Toe	97.7	477	Connect Four	97.2
413	INIT	97.4	478	Hands Down	97.3
414	Gunkimono	97.2	479	Hands Down	97.7
415	INIT	97.6	480	Hands Down	97.5
416	Gunkimono	97.6	481	INIT	97.5
417	Imhotep	98.0	482	Codenames	97.6
418	Broom Service: Card Game	98.1	483	Codenames	97.7
419	Captain Sonar	97.8	484	Pass The Pigs	97.5
420	Quest for El Dorado	97.5	485	Pass The Pigs	97.2
421	KeyForge	97.5	486	Tripoley	97.7
422	KeyForge	97.5			
423	KeyForge	97.5			
424	Nightvault	97.5			
425	INIT	97.1			
426	Fuji Flush	97.6			
427	Blitz Bowl	97.6			
428	INIT	97.4			
429	Cryptid	97.4			
430	KeyForge	97.9			
431	Diamant:	97.6			
432	Bob Ross: Art Of Chill	97.0			
433	Reef	97.3			
434	Foppen	96.4			
435	KeyForge	97.8			
436	Santorini	97.4			
437	Dingo's Dreams	97.7			
438	Rise Of Augustus	98.1			
439	Isle Of Skye	97.7			
440	INIT	97.2			
441	Tokaido	97.2			
442	INIT	97.4			
443	KeyFlow	97.3			
444	KeyForge	97.0			
445	Fabled Fruit	97.4			
446	Witness	98.5			
447	Witness	98.9			
448	Potato Man	97.6			
449	INIT	96.9			
450	Orleans	97.6			