

Crucible Data Analysis Report

Destiny 2 - Season 18

May 27, 2024

All research conducted in this report was conducted as an independent personal study to discover interesting trends and correlations in Destiny 2's publicly available PVP data via Bungie's API



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Context & Research Questions

Context

Kei was tasked to investigate what classes perform the best in Destiny 2's PVP mode The Crucible.

Example Guiding Research Questions

- What class on average is performs the strongest?
- Does light level play a factor in how good a player is?
- What class scores the most assists?
- Does KDA go up with Combat rating?

Limitations

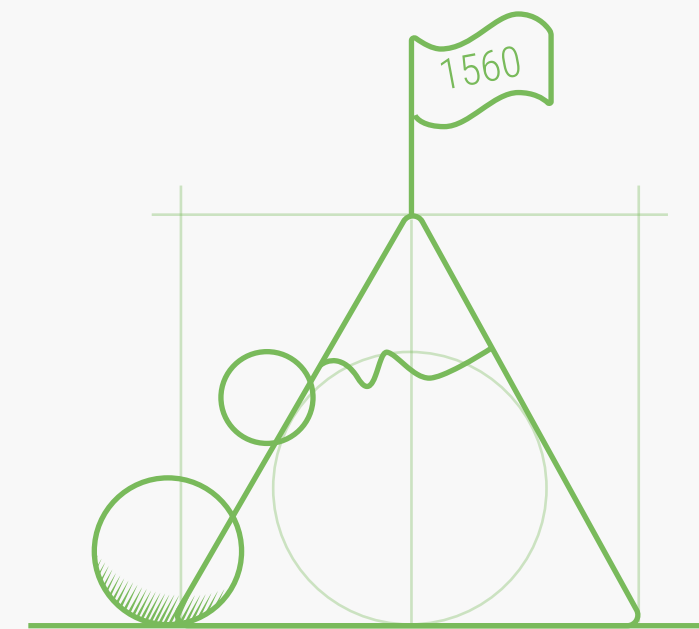
- Only data endpoints that is publicly available from Bungie's API's.
 - This means not *every* telemetry hook is accessible.
- This Data is a snapshot from December 2022

Core Findings



Hunters are Dominant

Hunters on average play the strongest PVP stats compared to other classes. Additionally, there are far more hunters than other classes.



Higher Light, Higher Skill

The higher one's light level is, the higher their combat rating is. This isn't surprising given the higher the light level, the more one has played the game.

Demographics

Who are our players?

Player Demographics

Total

100000 Participants

Class

42587 Hunters

23808 Titans

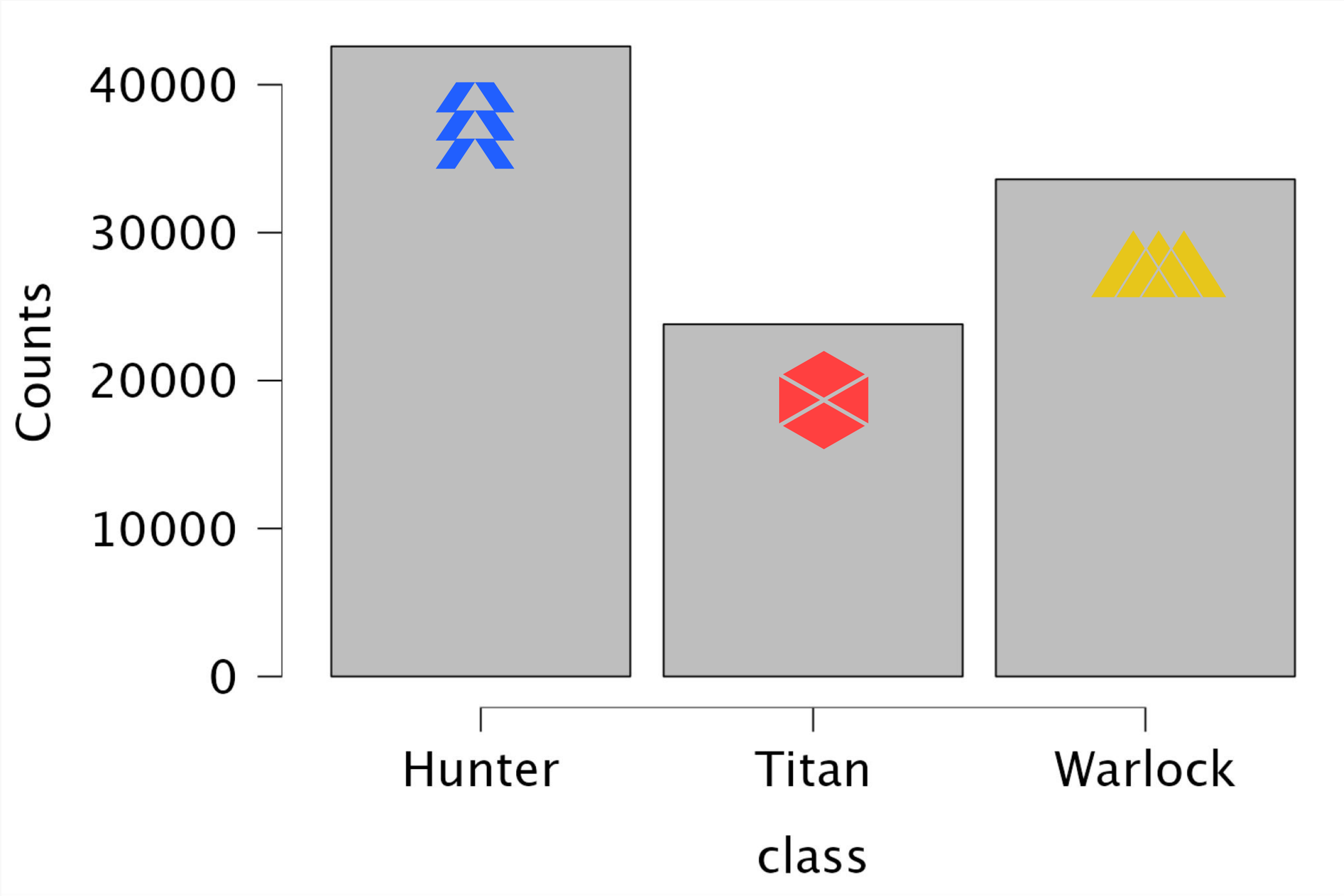
33605 Warlocks

Findings

Hunters are the most popular class to play.

Titans have the least players among the three classes

Distribution of players by Class



T-Tests

We ran T-tests to compare averages between the groups of classes. The questions we asked were:

- What class on average is performs the **strongest** (Combat Rating)?
- What class scores the **most assists**?
- What class has the best **average score per life**?
- What class has the strongest average **KDA**?

Legend

Class:

Destiny 2 has three classes

-  Hunter
-  Warlock
-  Titan

Significant Findings:

-  Significantly more
-  No significant finding

Example reading:

-   
• "Hunters on average score, significantly higher than Warlocks on X metric."

Strongest Class

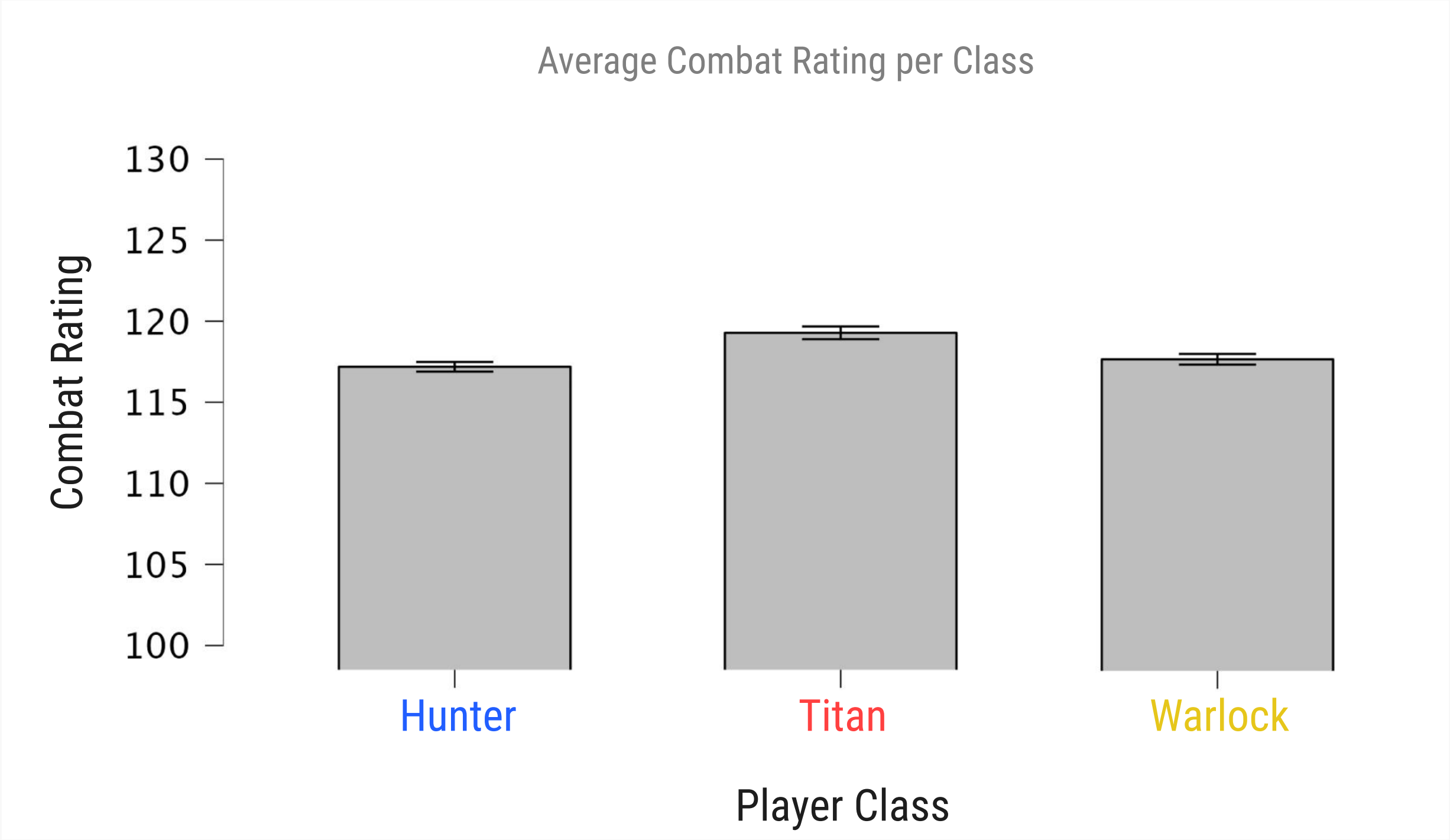
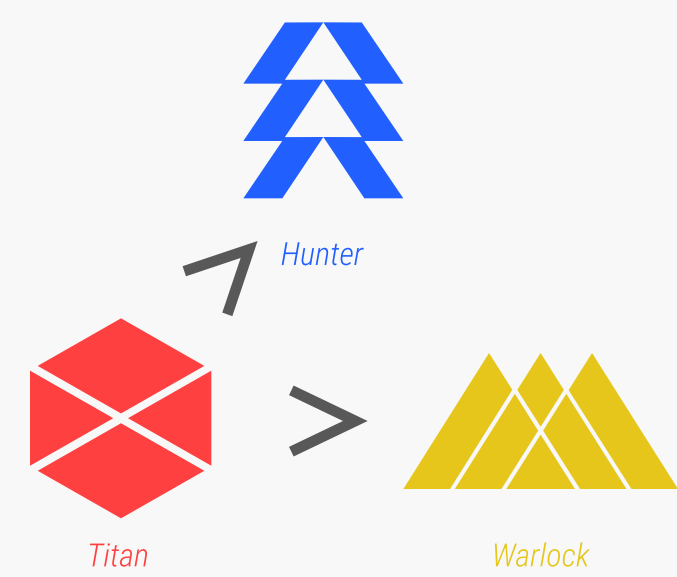
Context

We investigated to see if any classes on average are performing better than others by looking at **Combat Rating**.

Combat Rating is numerical value which is a cumulative average of all your PVP actions to effectively gauge player skill.

Results

We found that Titans perform better than both Hunters and Warlocks with a significantly higher average Combat Rating.



Interpretation

- Titans players perform very strongly in PvP.
 - This may require further investigation on the relationship of Titan’s ability and movement kits compared to others or why more skilled players play Titan compared to other classes.
- Hunters and Warlocks are in a good place where neither classes are outperforming each other by a significant degree

Independent Samples T-Test				
Hunter-Titan	t	df	p	Mean Difference
combatRating	-8.339	49916.749	< .001	-2.095
Hunter-Warlock				
combatRating	-2.340	72517.116	0.019	-0.532
Titan-Warlock				
combatRating	5.970	51366.398	< .001	1.563

Descriptive Statistics			
	combatRating		
	Hunter	Titan	Warlock
Valid	42587	23808	33605
Missing	0	0	0
Mean	117.189	119.284	117.721
Std. Deviation	31.357	30.865	30.969
Minimum	0.000	0.000	0.000
Maximum	296.585	261.551	266.241

Most Assists Scored

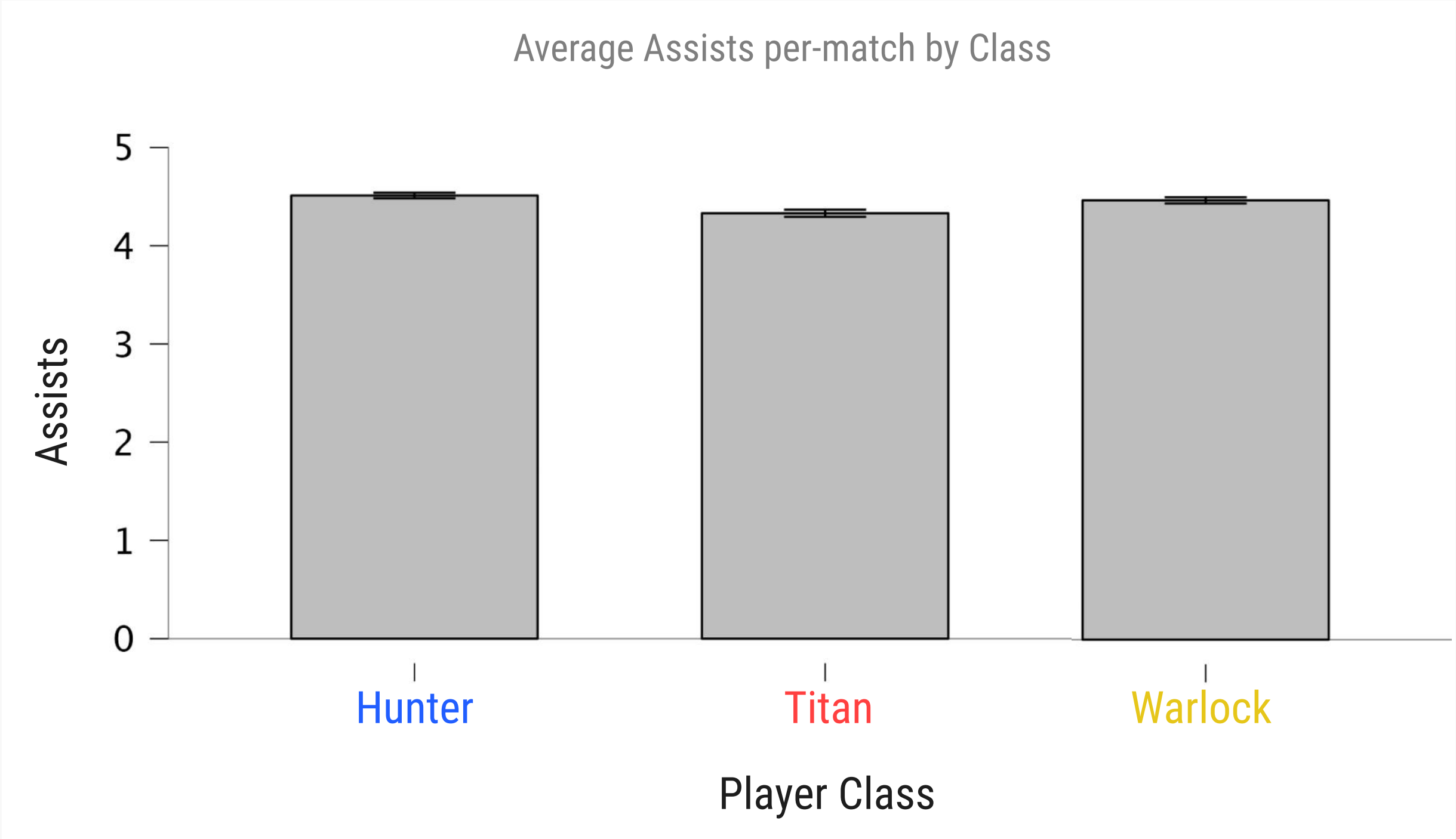
Context

We investigated to see if any classes are on average scoring **more assists** than others.

Assists are defined as damage dealt to the target within the past 5 seconds, but not the person to secure the kill.

Results

We found that Hunters and Warlocks score significantly more assists on average than Titans.



Independent Samples T-Test				
	t	df	p	Mean Difference
Hunter-Titan				
assists	7.664	50870.113	< .001	0.181
Hunter-Warlock				
assists	1.723	72420.571	0.085	0.037
Titan-Warlock				
assists	-5.819	52154.968	< .001	-0.144

Descriptive Statistics			
	assists		
	Hunter	Titan	Warlock
Valid	42587	23808	33605
Missing	0	0	0
Mean	4.511	4.330	4.474
Std. Deviation	2.988	2.875	2.961
Minimum	0.000	0.000	0.000
Maximum	21.000	23.000	22.000

Interpretation

- This suggests that Titans may be the least engaged with team play.
 - This could be because Titans’ gameplay loop revolves around quick close quarters all-or-nothing melee centric engagements. This play-style does not heavily involve the team.

Best Average Score per life

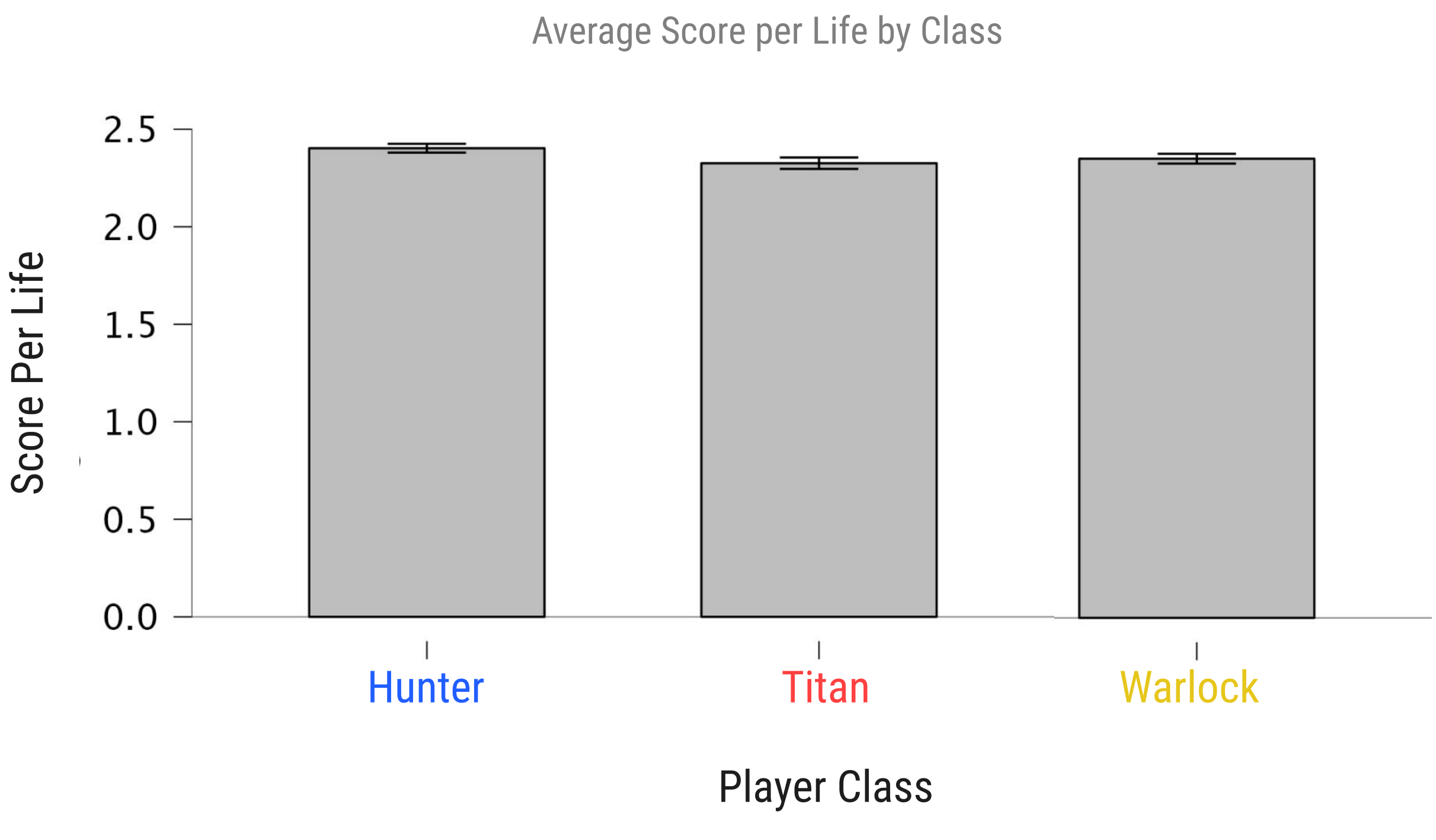
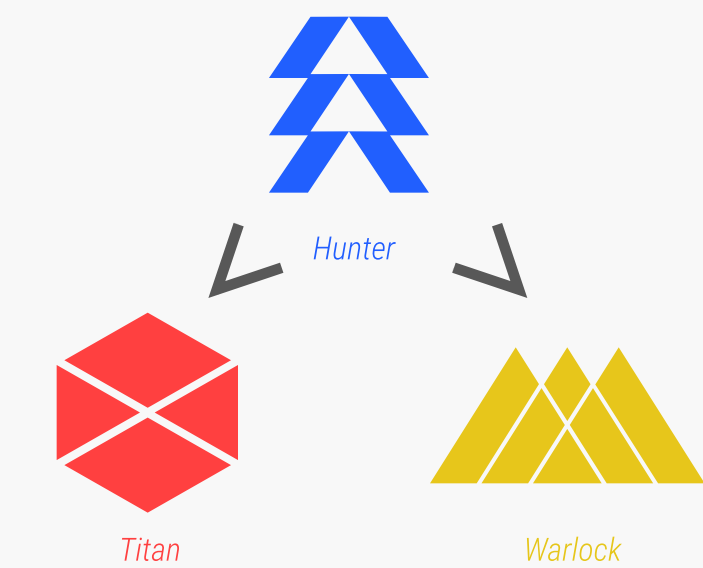
Context

We investigated to see if any classes are on average **scoring the most per life** than others

Score Per life is defined as on average how much you scored before you died. Score is calculated by 1 point per control point captured and 1 point per kill per point on the map held.

Results

We found that Hunters score significantly higher per life on average than the other classes.



Independent Samples T-Test				
	t	df	p	Mean Difference
avgScorePerLife	4.078	50788.315	< .001	0.077
Hunter-Warlock				
avgScorePerLife	2.601	72456.750	0.009	0.045
avgScorePerLife	-1.620	52061.972	0.105	-0.032

Descriptive Statistics			
	avgScorePerLife		
	Hunter	Titan	Warlock
Valid	42587	23808	33605
Missing	0	0	0
Mean	2.403	2.326	2.358
Std. Deviation	2.384	2.298	2.359
Minimum	0.000	0.000	0.000
Maximum	47.000	56.000	66.000

Interpretation

- In Control, the majority of the points will be scored via kills rather than capturing control points.
- This may indicate that Hunters are the best class to capitalize on a control point advantage and get more kills that boost their score per life than other classes

Strongest Average KDA

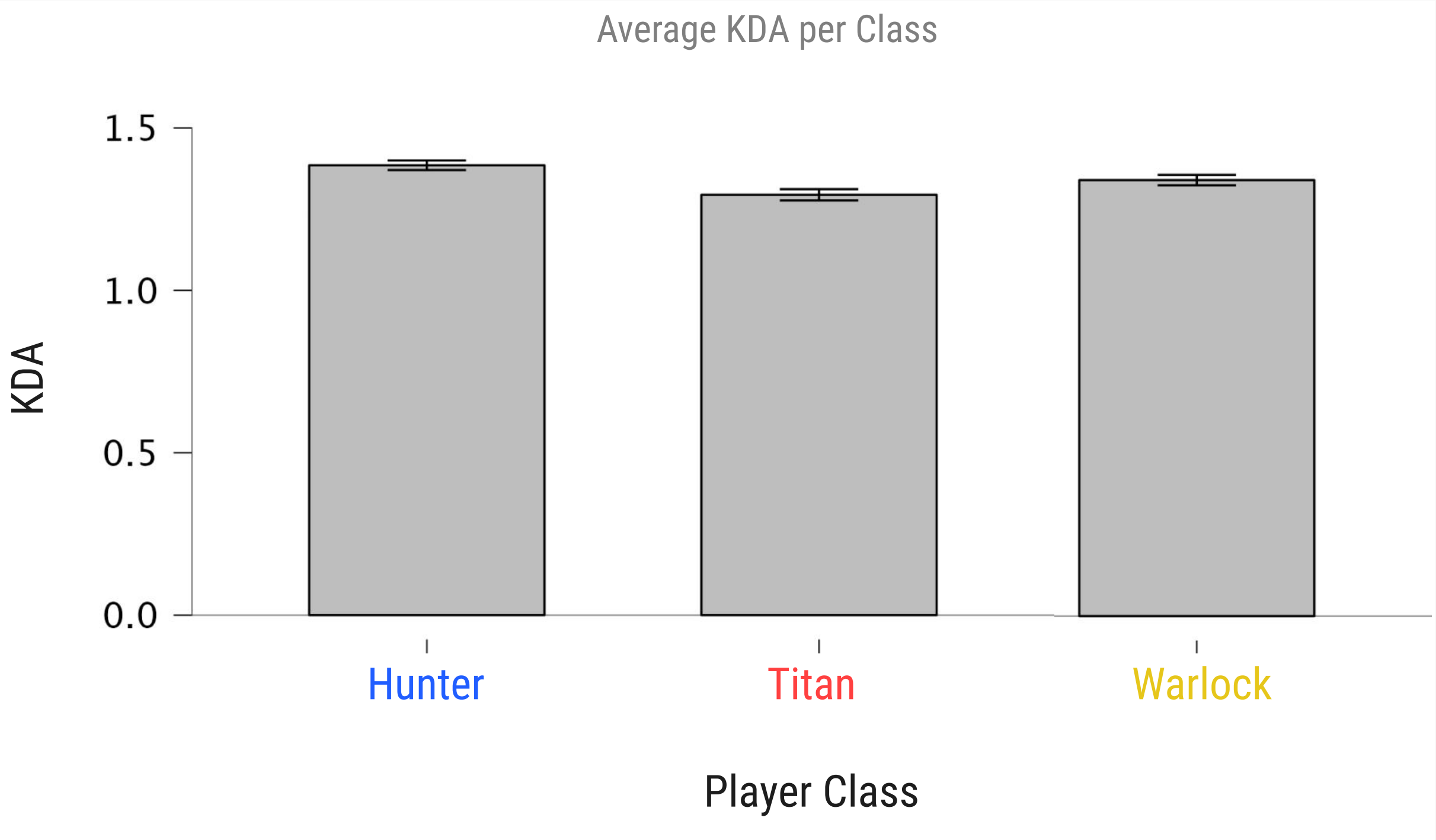
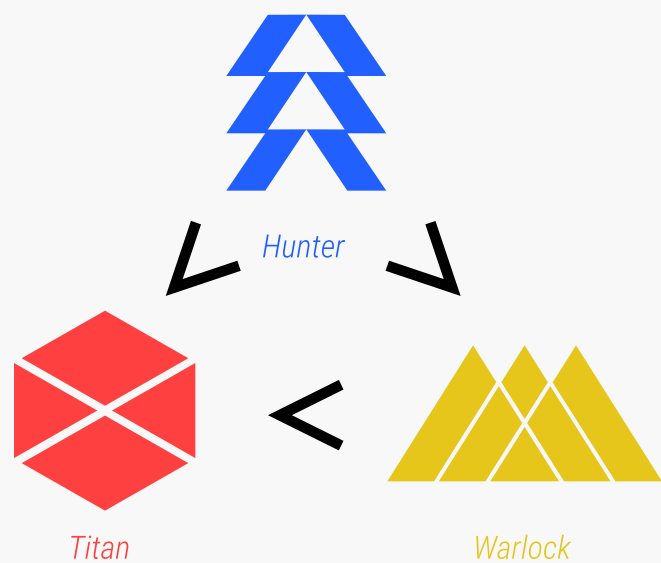
Context

We investigated to see if any class on average scores a higher **KDA*** than others.

KDA (Kills, Deaths, Assists) is defined as the average score between all three factors within the match.

Results

We found that Hunters score a significantly higher KDA on average than both Titans and Warlocks. In addition, Warlocks score significantly higher than Titans.



Independent Samples T-Test				
Hunter-Titan	t	df	p	Mean Difference
kda	7.821	55119.314	< .001	0.091
Hunter-Warlock				
kda	3.772	73309.125	< .001	0.042
Titan-Warlock				
kda	-4.054	54106.942	< .001	-0.049

Descriptive Statistics			
	kda		
	Hunter	Titan	Warlock
Valid	42587	23808	33605
Missing	0	0	0
Mean	1.385	1.294	1.343
Std. Deviation	1.563	1.360	1.502
Minimum	0.000	0.000	0.000
Maximum	32.500	30.500	35.000

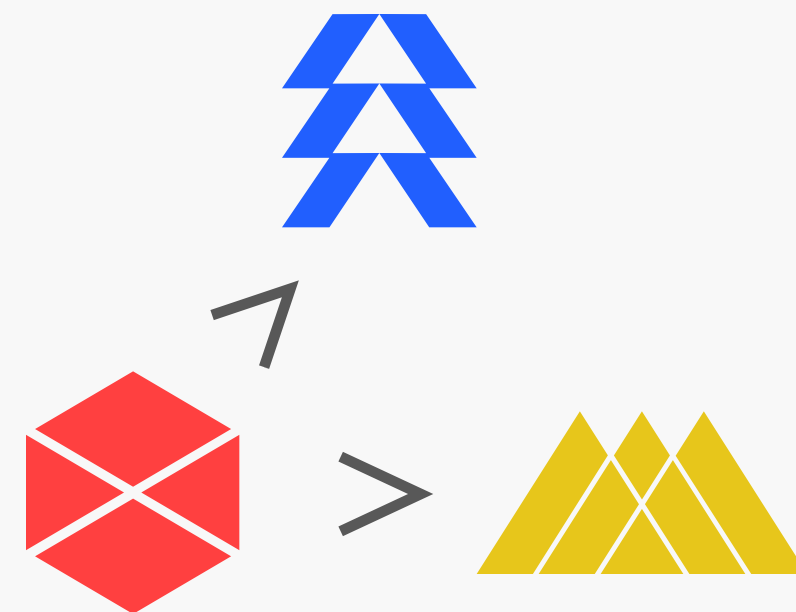
Interpretation

- This suggests that Hunters are better at scoring kills and deaths before dieing compared to other classes.
 - Their dodge ability which allows them to get to safety mid gunfight, and may be a factor in minimizing deaths.
- Titans die significantly more than other classes.
 - Assumptions about the class, being a high-risk high-reward melee brawler may play into a reason for a lower KDA.

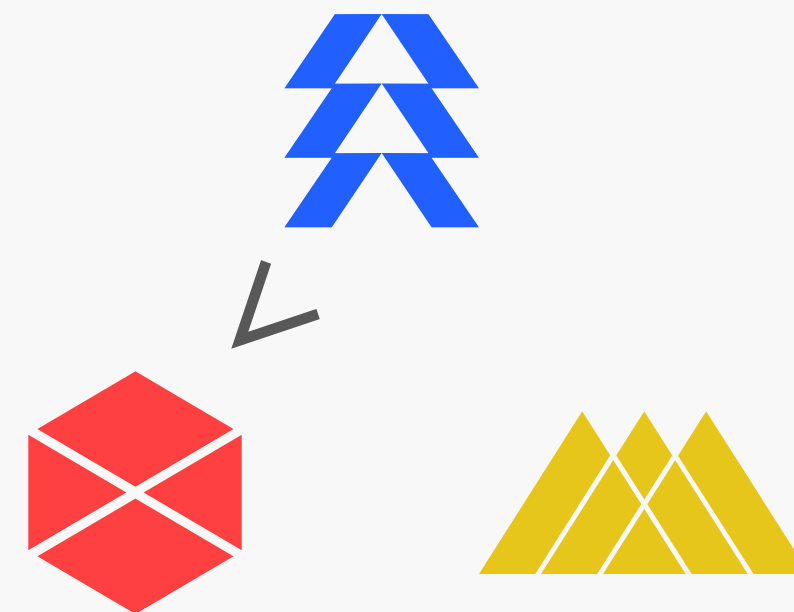
Summary

Findings:

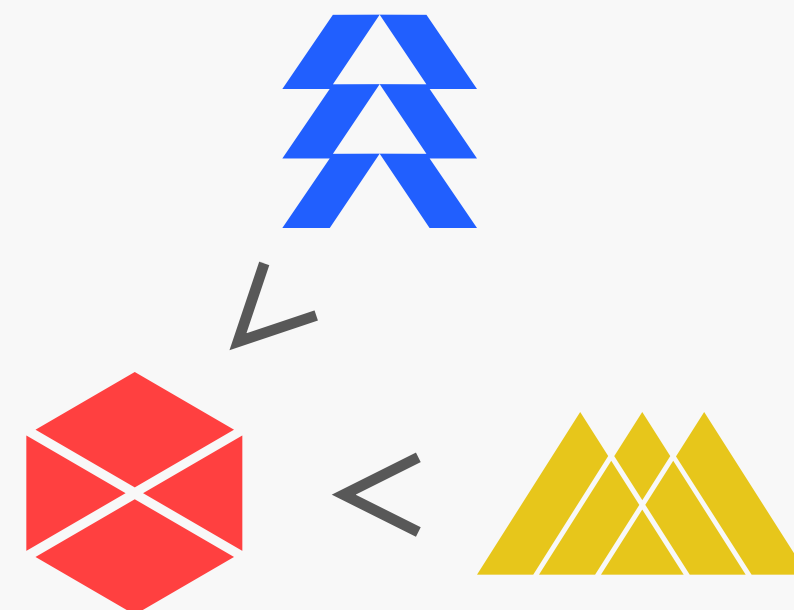
Average Combat Rating



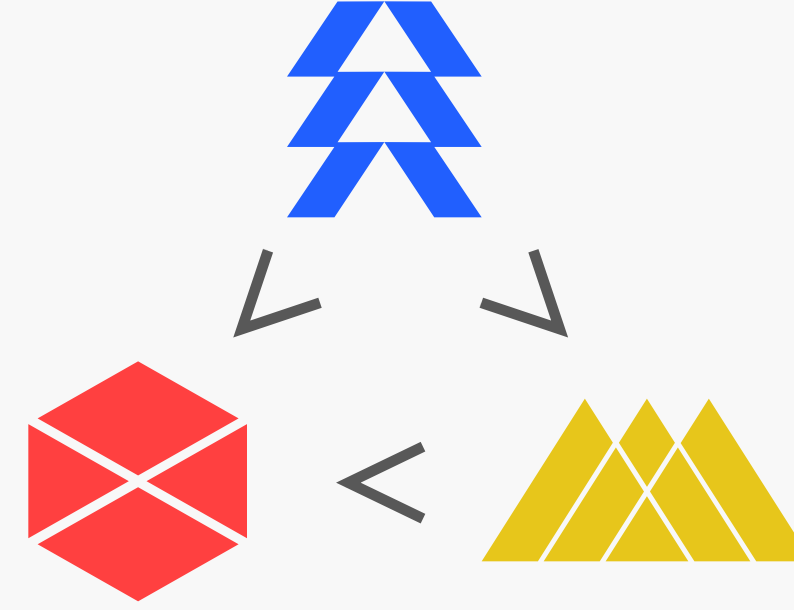
Average Score per Life



Average Assists



KDA



 Hunter  Warlock  Titan

Walk-aways:

Titans have the **highest skilled** players on average.

Hunters are the **best performing** class on average.

Titans score a better average Combat Rating than both classes, however Hunters score a better KDA than both classes. (And in general, every other metric measured more than Titans). This seems contradictory!

This has implications that the Combat Rating takes more metrics than those measured for this test. This may be from more abstract data such as Aim, Crit %s, to movement pathing efficiency, and effective use of abilities. By pure game outcome scoring metrics Titans may not contribute as much, but may have a pool of higher skilled players overall.

Other measured factors such as MMR may play significant role in analysis of this data, as scoring in isolation is heavily different depending on who the opponents are. Further research may need to assess this by taking both Combat Rating and MMR into consideration to adjust score values in a game.

Regressions

We ran some regressions to compare if there's any correlation between the measured data. We asked questions such as:

- Is there a relation between Light level and Combat Rating
- Is there a relation between the Average Score per life and KDA?

Light level to Combat Rating

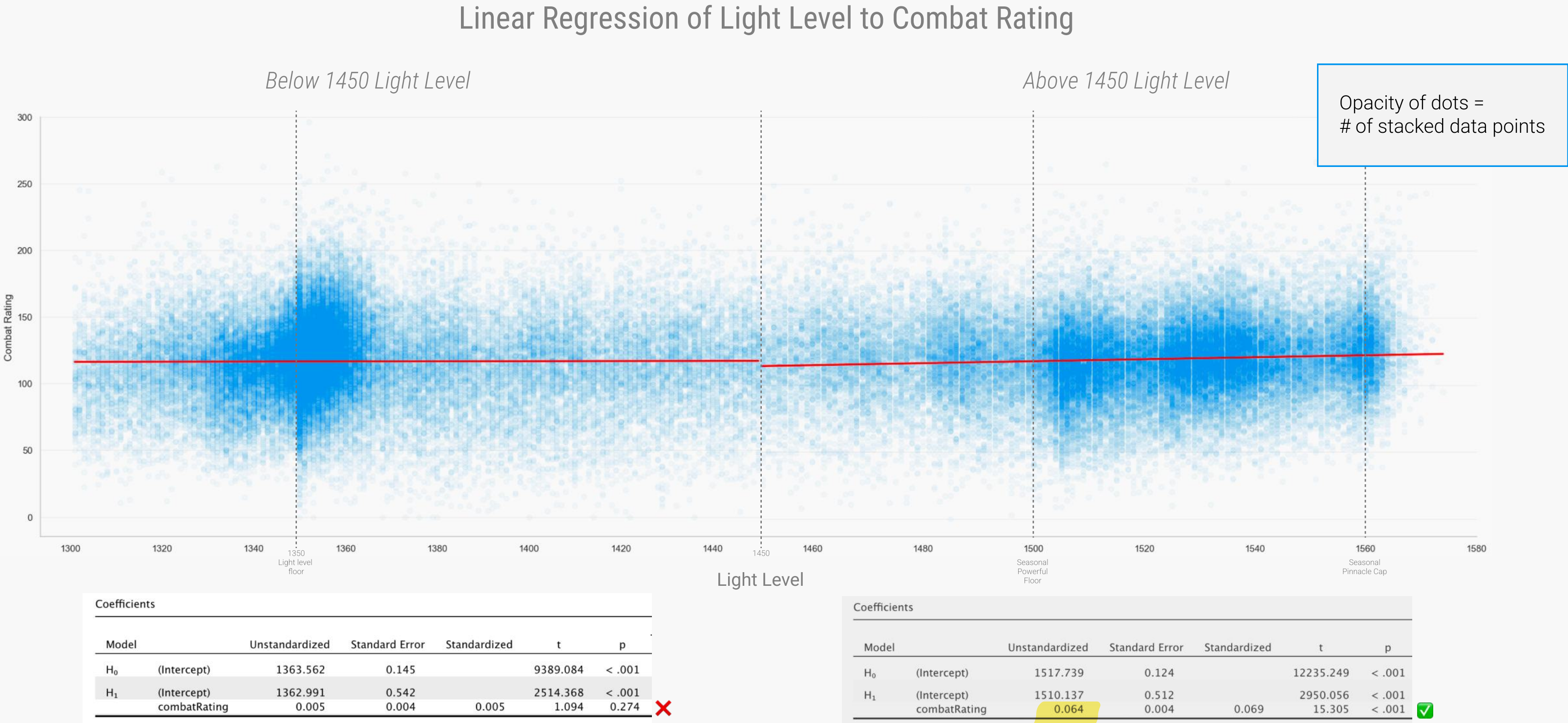
Context

We investigated to see if there is any relationship between **Light Level** and **Combat Rating**.

Light Level was split into two groups, those above 1450 and below. This is to distinguish groups players between those who are playing actively and those who are not

Results

We found that there is a weak, but significant positive relationship between Combat Rating and Light Level for those who were over 1450 light level.



Interpretation

- This suggests that past 1450, Combat Rating goes up as Light Level goes up.
 - This makes sense as the active players of the games would be those who hit the light level cap. Additionally in other end-game PvP game modes such as Trials of Osiris, higher Light Level is a requirement for competing. Thus, incentivizing players who are serious about PvP to attain a higher Light Level

Relation between Deaths & Kills

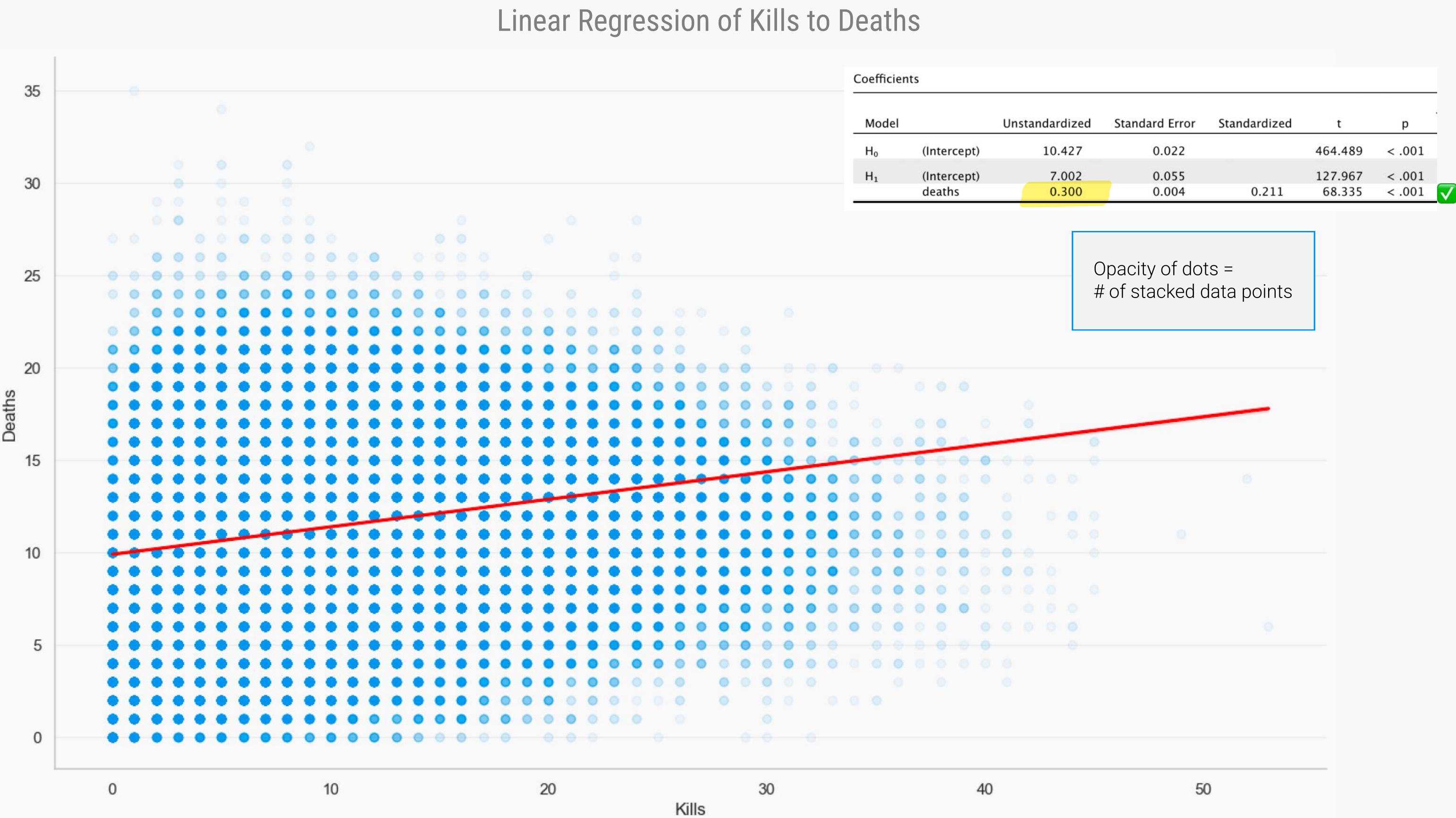
Context

We investigated to see if there is any relationship between **Death Count** and **Kill** count

Kills is the number of finishing blows the player score in the match
Death is the number of times that the player died in the match

Results

We found that there is a significant positive relationship between Death and Kills where higher the death count, the higher the score will trend



Interpretation

- This relationship may be caused by an external factor such as game duration. The longer a player is in a match, the more deaths and kills they will have as the Control game mode is respawn based game mode.

Chi-Squared

We ran some Chi Squared Goodness of Fit and effect size tests to determine how strong the effect size is for

- Classes
- Platforms Played

Chi Square and Phi Coefficient

Context

We observed 100000 players to see what classes they play

- 42587 Hunters
- 33605 Warlocks
- 23808 Titans

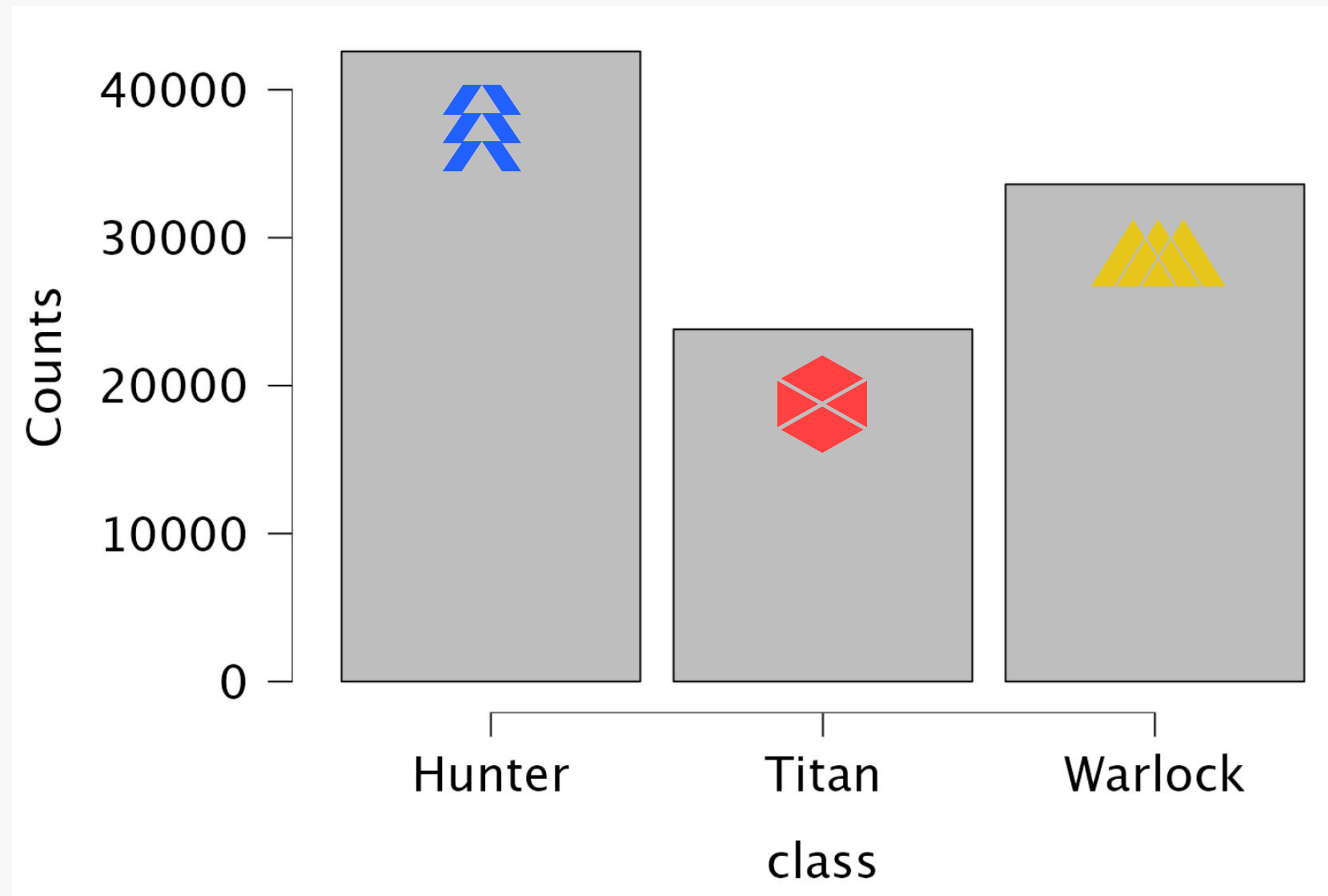
Results

We expected that there should be 33333 of each class.

It is significant that there was a difference in expected distributions, with far more hunters than expected.

A weak effect size was detected, however, this may not be detected given a smaller sample size

Distribution of players by Class



Stats:

- Chi-Square Statistic: 5293.08374
- P-Value: < .00001
- Cramér's V (Effect size): 0.1626819556681072

Chi Square and Phi Coefficient

Context

We observed 100000 players to see what platform they play on.

- 47523 Steam
- 28312 Playstation
- 23926 Xbox
- 239 Stadia

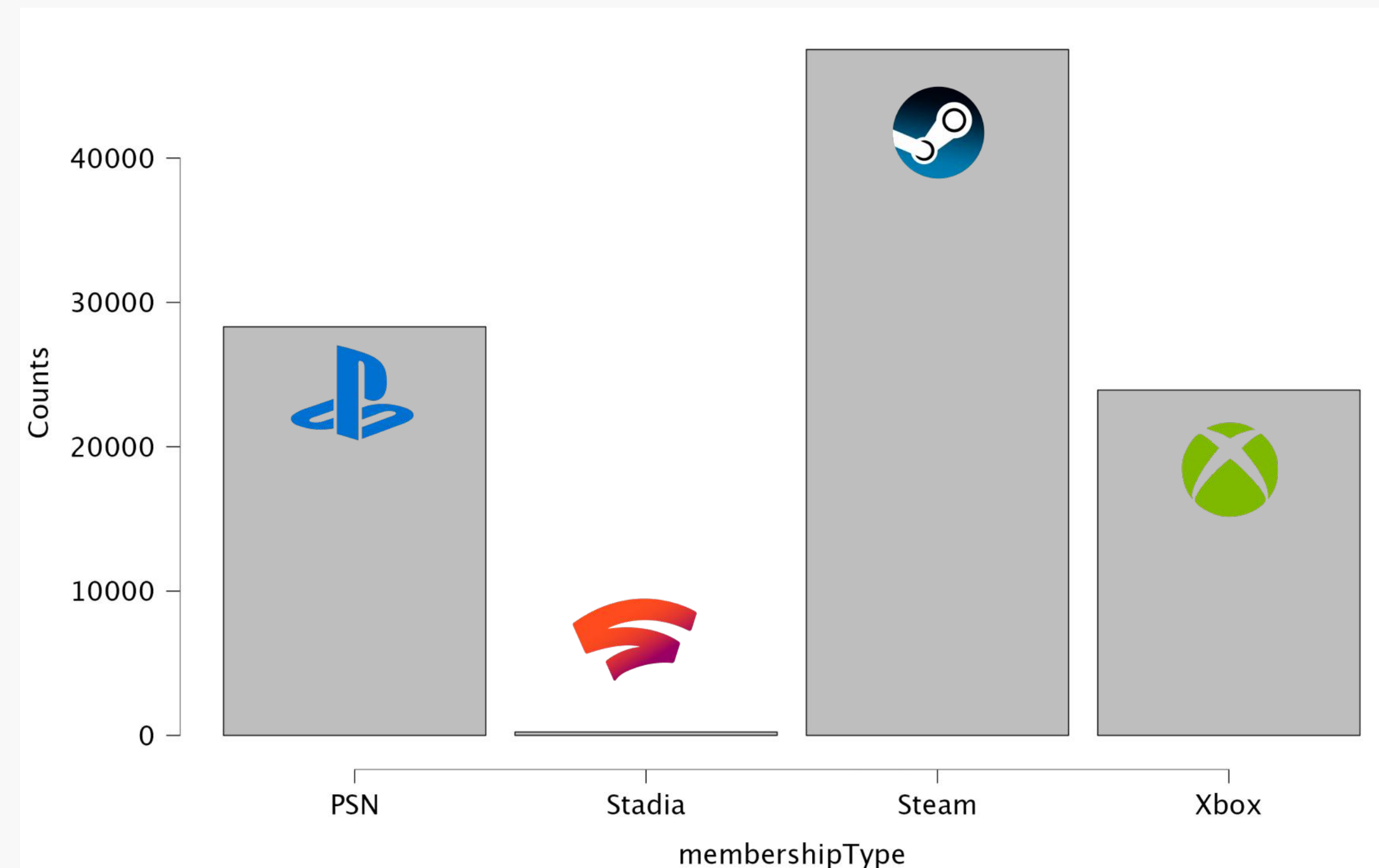
Results

We expected that there should be 25000 of each platform played.

It is significant that there was a difference in expected distributions, with far more Steam players and far less Stadia players.

A medium effect size was detected, signifying that even with a smaller population sample, we can expect very little Stadia players in Destiny 2.

Distribution of players by Platform



Stats:

- Chi-Square Statistic: 45300.6188
- P-Value: < .00001
- Cramér's V (Effect size): 0.388589838604494

ANOVAS

We ran ANOVAS to compare averages between the groups of classes. The questions we asked were:

- What class on average is performs the **strongest** (Combat Rating)?
- What class scores the **most assists**?
- What class has the best **average score per life**?
- What class has the strongest average **KDA**?

This should net us the same results as running multiple T-Tests

Legend

Class:

Destiny 2 has three classes

-  Hunter
-  Warlock
-  Titan

Significant Findings:

- $>$ Significantly more
- $=$ No significant finding

Example reading:

-  $>$ 
• "Hunters on average score, significantly higher than Warlocks on X metric."

Strongest Class - ANOVA

Context

We investigated to see if any classes on average are performing better than others by looking at **Combat Rating**.

Combat Rating is numerical value which is a cumulative average of all your PVP actions to effectively gauge player skill.

Results

We found that Titans perform better than both Hunters and Warlocks.



Descriptives

Descriptives – combatRating

class	N	Mean	SD	SE	Coefficient of variation
Hunter	42587	117.189	31.357	0.152	0.268
Titan	23808	119.284	30.865	0.200	0.259
Warlock	33605	117.721	30.969	0.169	0.263

ANOVA – combatRating

Welch	class	68087.549	2.000	34043.775	35.409	< .001	7.030×10 ⁻⁴
	Residuals	9.678×10 ⁺⁷	59169.563	1635.693			

Note. Type III Sum of Squares

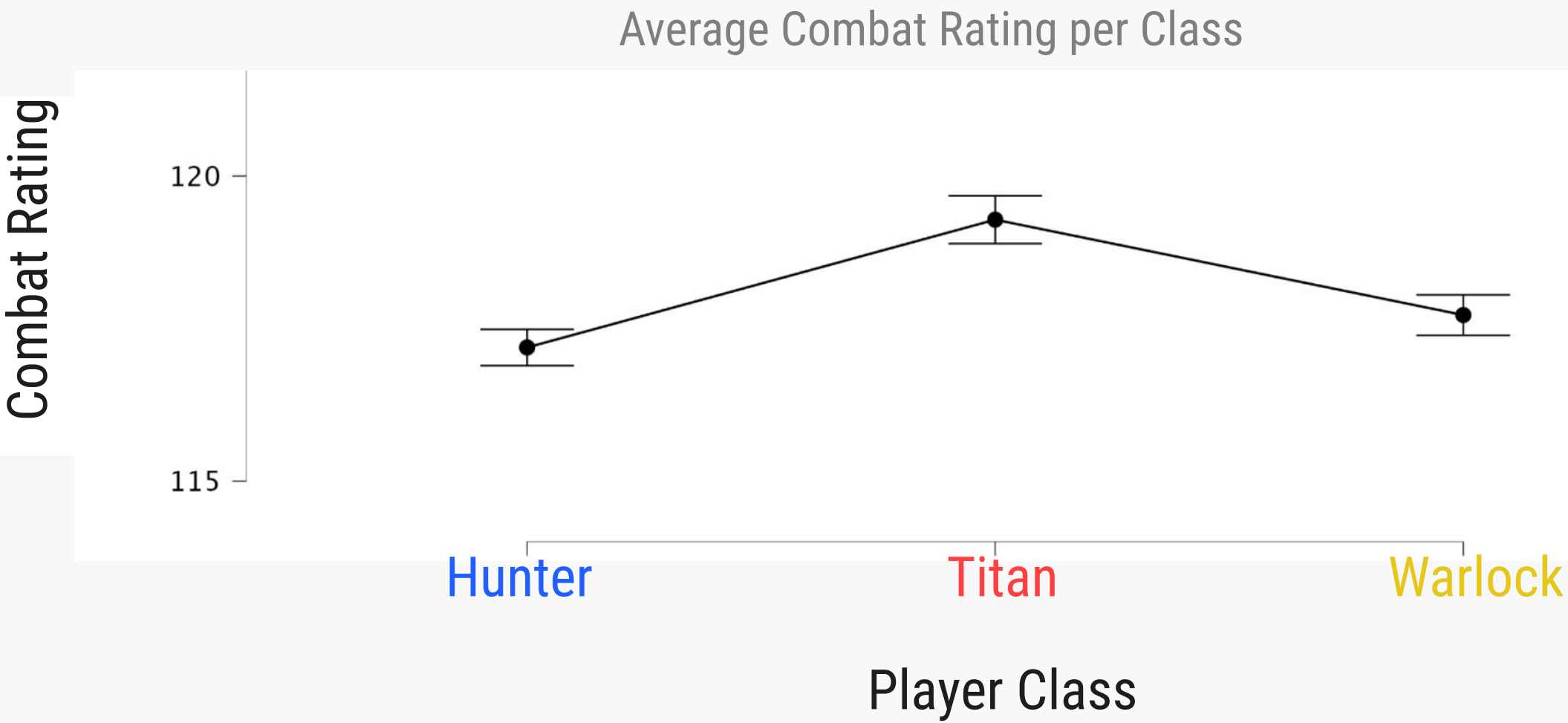
Post Hoc Tests

Standard

Post Hoc Comparisons – class

		Mean Difference	SE	t	Pbonf
Hunter	Titan	−2.095	0.252	−8.321	< .001
	Warlock	−0.532	0.227	−2.343	0.057
Titan	Warlock	1.563	0.264	5.931	< .001

Note. P-value adjusted for comparing a family of 3



Interpretation

- Titans players perform very strongly in PvP.
- Titans perform the best with on average 2.095 CR better than Hunters and 1.56 CR better than Warlocks.

Strongest KDA - ANOVA

Context

Earlier we looked at T-tests for KDA and we came down to a finding. However, running the ANOVA and looking at the Q-Q plot, we discovered that we had violated the assumption of normality of data.

Results

However, ANOVAs are resilient to violations of normality of Data. Despite the Q-Q plot not showing a linear relationship, due to the high N of data I have, these aer still significantly significant findings.

ANOVA - KDA

ANOVA - kda							
Homogeneity Correction	Cases	Sum of Squares	df	Mean Square	F	p	η^2
None	class	128.152	2.000	64.076	28.621	< .001	5.721×10 ⁻⁴
	Residuals	223867.069	99997.000	2.239			
Welch	class	128.152	2.000	64.076	30.643	< .001	5.721×10 ⁻⁴
	Residuals	223867.069	60980.228	3.671			

Note. Type III Sum of Squares

Descriptives

Descriptives - kda						
class	N	Mean	SD	SE	Coefficient of variation	
Hunter	42587	1.385	1.563	0.008	1.128	
Titan	23808	1.294	1.360	0.009	1.051	
Warlock	33605	1.343	1.502	0.008	1.118	

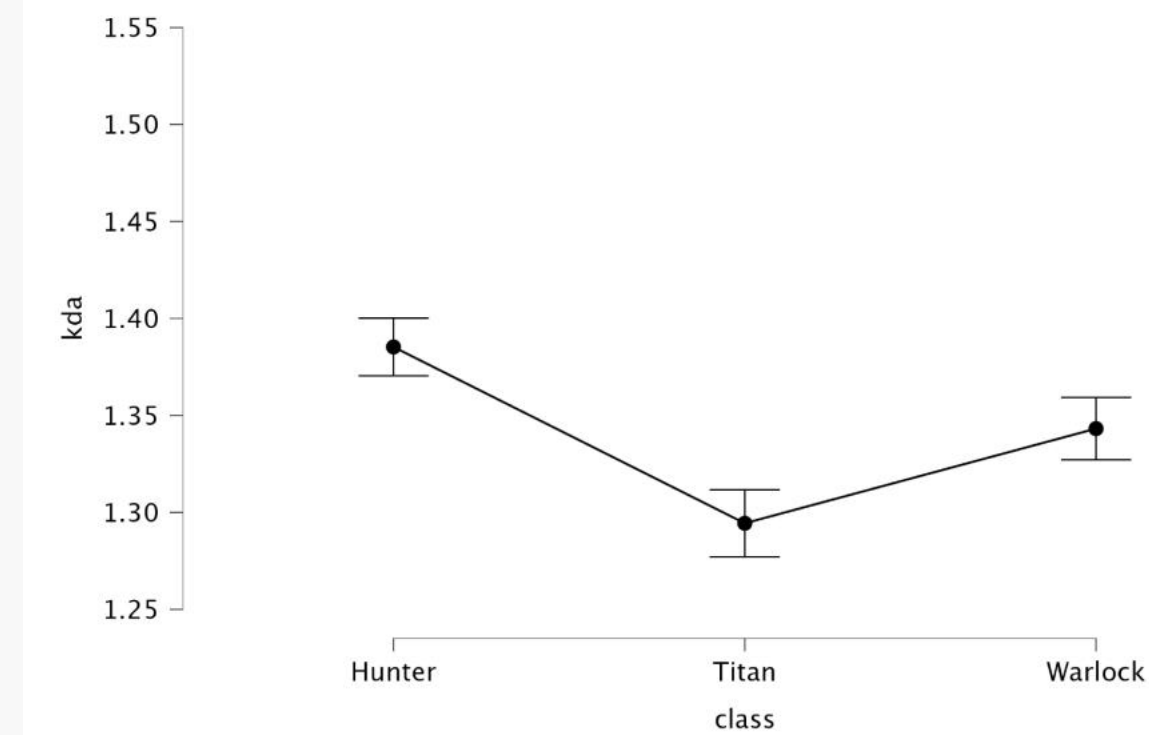
Post Hoc Tests

Standard

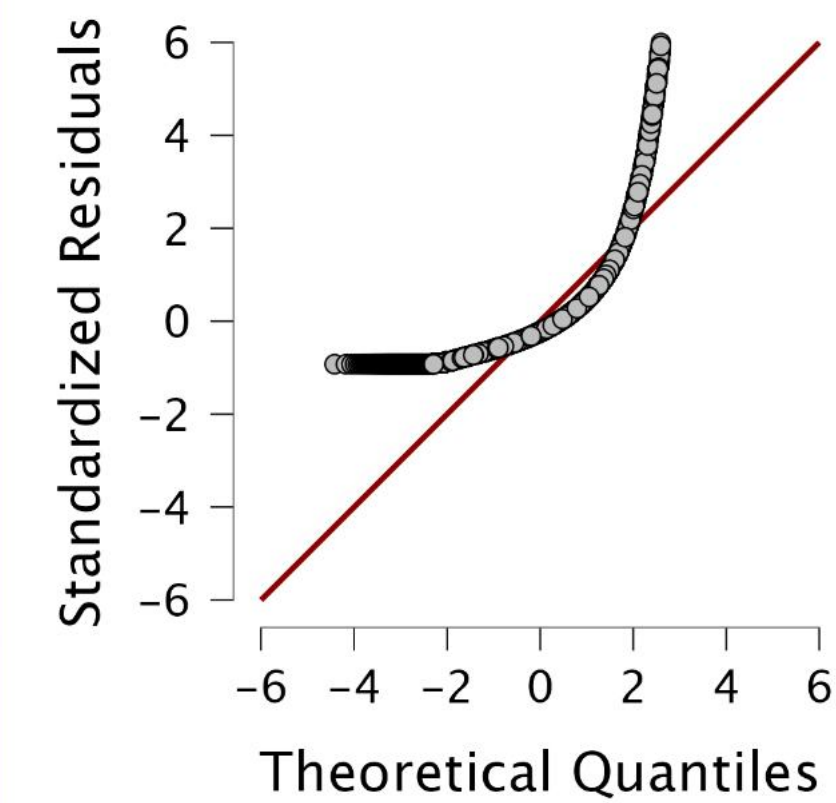
Post Hoc Comparisons - class					
		Mean Difference	SE	t	Pbonf
Hunter	Titan	0.091	0.012	7.506	< .001
	Warlock	0.042	0.011	3.855	< .001
Titan	Warlock	-0.049	0.013	-3.850	< .001

Note. P-value adjusted for comparing a family of 3

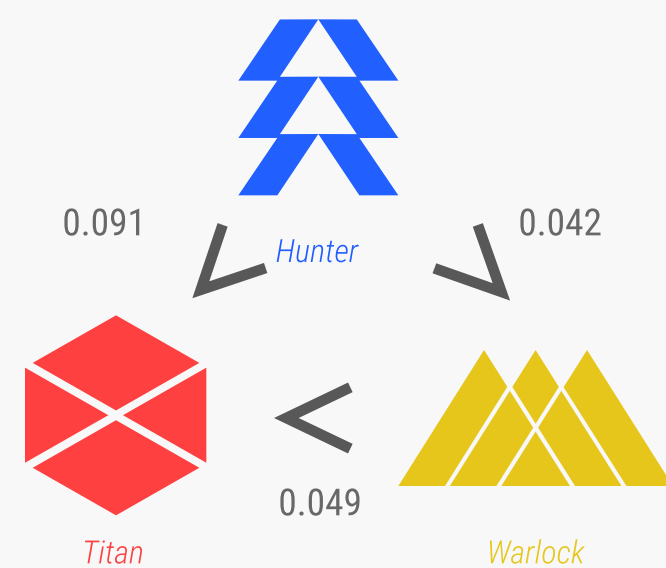
Descriptives plots



Q-Q Plot



On Average
KDA:



Thoughts:

- We should analyze difference in class for players who are above 1500 Light level only, to look if a relationship exists for the subset of active players to see if inactive players are throwing off the data

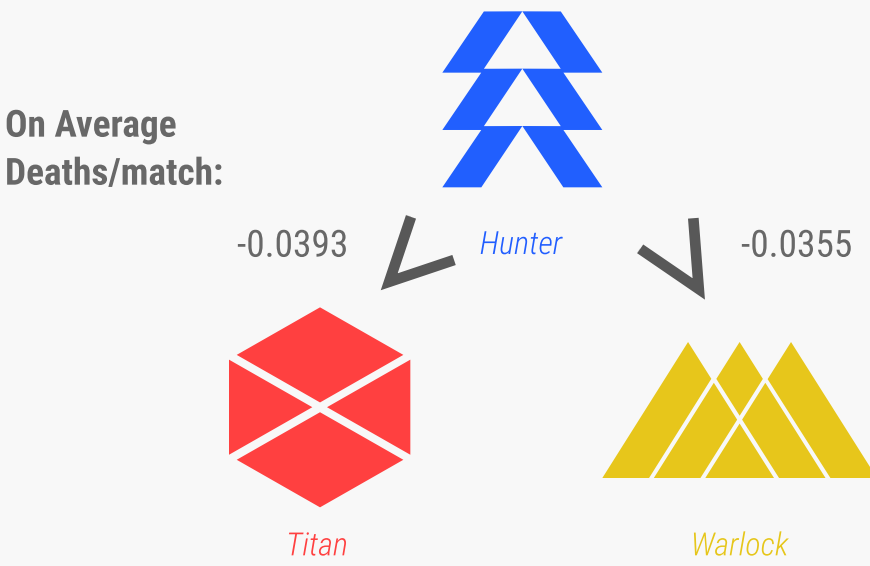
Most Deaths - ANOVA

Context

We investigated if any class has significantly more deaths than the other. **For players over 1500 light level**

Results

For active players (1500+ Light Level), hunters die significantly less than Titans and Warlocks per match



ANOVA ▼

ANOVA – deaths

Homogeneity Correction	Cases	Sum of Squares	df	Mean Square	F	p
Welch	class	1260.413	2.000	630.207	24.802	< .001
	Residuals	961052.376	22660.257	42.411		

Note. Type III Sum of Squares

Descriptives ▼

Descriptives – deaths

class	N	Mean	SD	SE	Coefficient of variation
Hunter	15460	11.428	5.012	0.040	0.439
Titan	9244	11.821	5.099	0.053	0.431
Warlock	12981	11.783	5.061	0.044	0.429

Post Hoc Tests

Standard

Post Hoc Comparisons – class

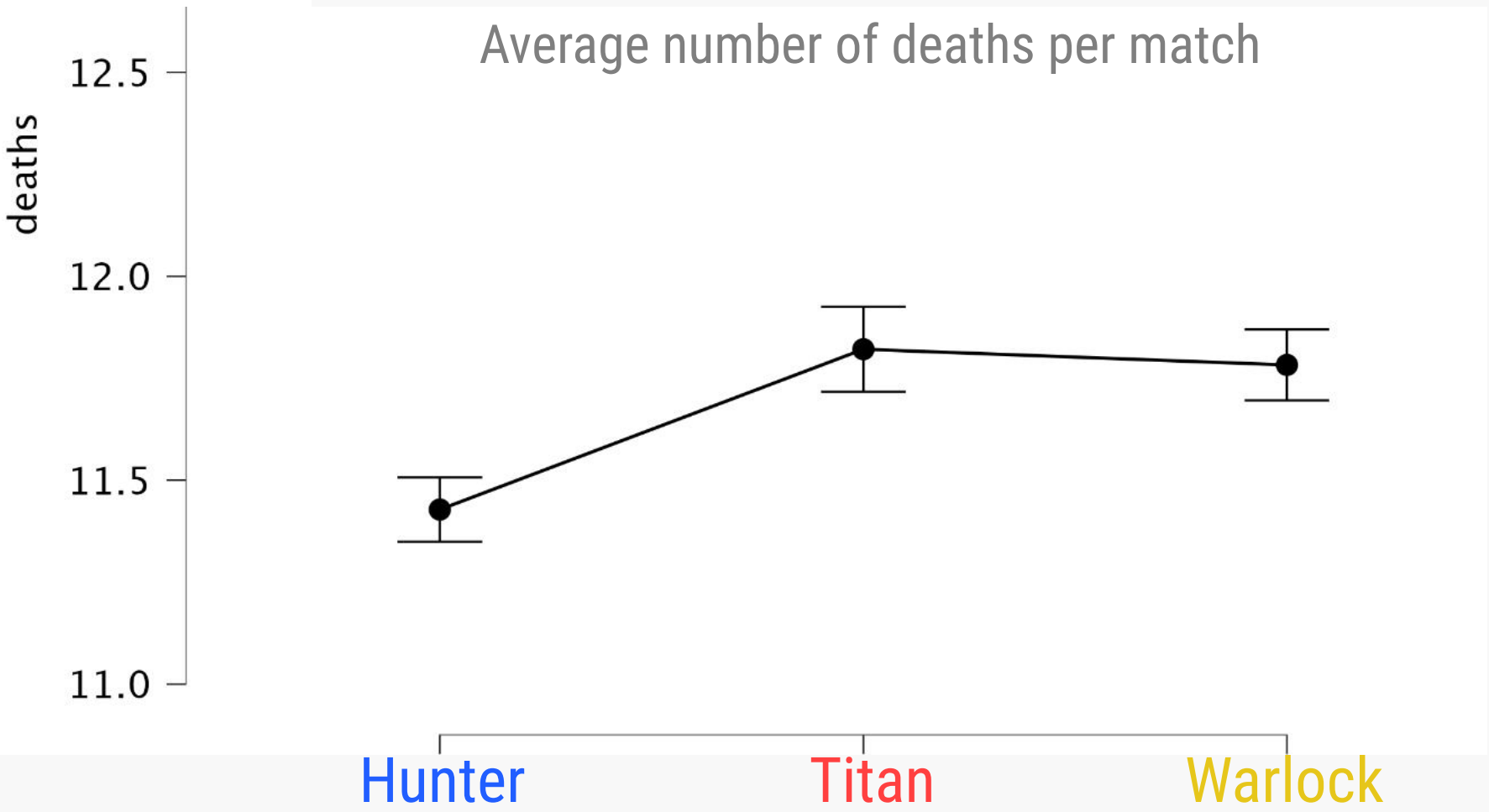
		Mean Difference	SE	t	P _{bonf}
Hunter	Titan	−0.393	0.066	−5.920	< .001
	Warlock	−0.355	0.060	−5.898	< .001
Titan	Warlock	0.038	0.069	0.560	1.000

Note. P-value adjusted for comparing a family of 3

Kruskal–Wallis Test

Kruskal–Wallis Test

Factor	Statistic	df	p
class	52.245	2	< .001



Interpretation

- Hunters may have more tools that enable them to stay alive significantly more than other classes

Opponents Defeated - ANOVA

Context

We investigated if any class has significantly more opponents defeated than the other. **For players over 1500 light level**

Results

For active players (1500+ Light Level), hunters are involved in finishing an opponent significantly more than the other classes.

ANOVA

ANOVA – opponentsDefeated

Homogeneity Correction	Cases	Sum of Squares	df	Mean Square	F	p
Welch	class	2204.734	2.000	1102.367	15.777	< .001
	Residuals	2.662×10 ⁶	22943.676	116.021		

Note. Type III Sum of Squares

Descriptives

Descriptives – opponentsDefeated

class	N	Mean	SD	SE	Coefficient of variation
Hunter	15460	14.949	8.514	0.068	0.570
Titan	9244	14.346	8.200	0.085	0.572
Warlock	12981	14.613	8.418	0.074	0.576

Post Hoc Tests

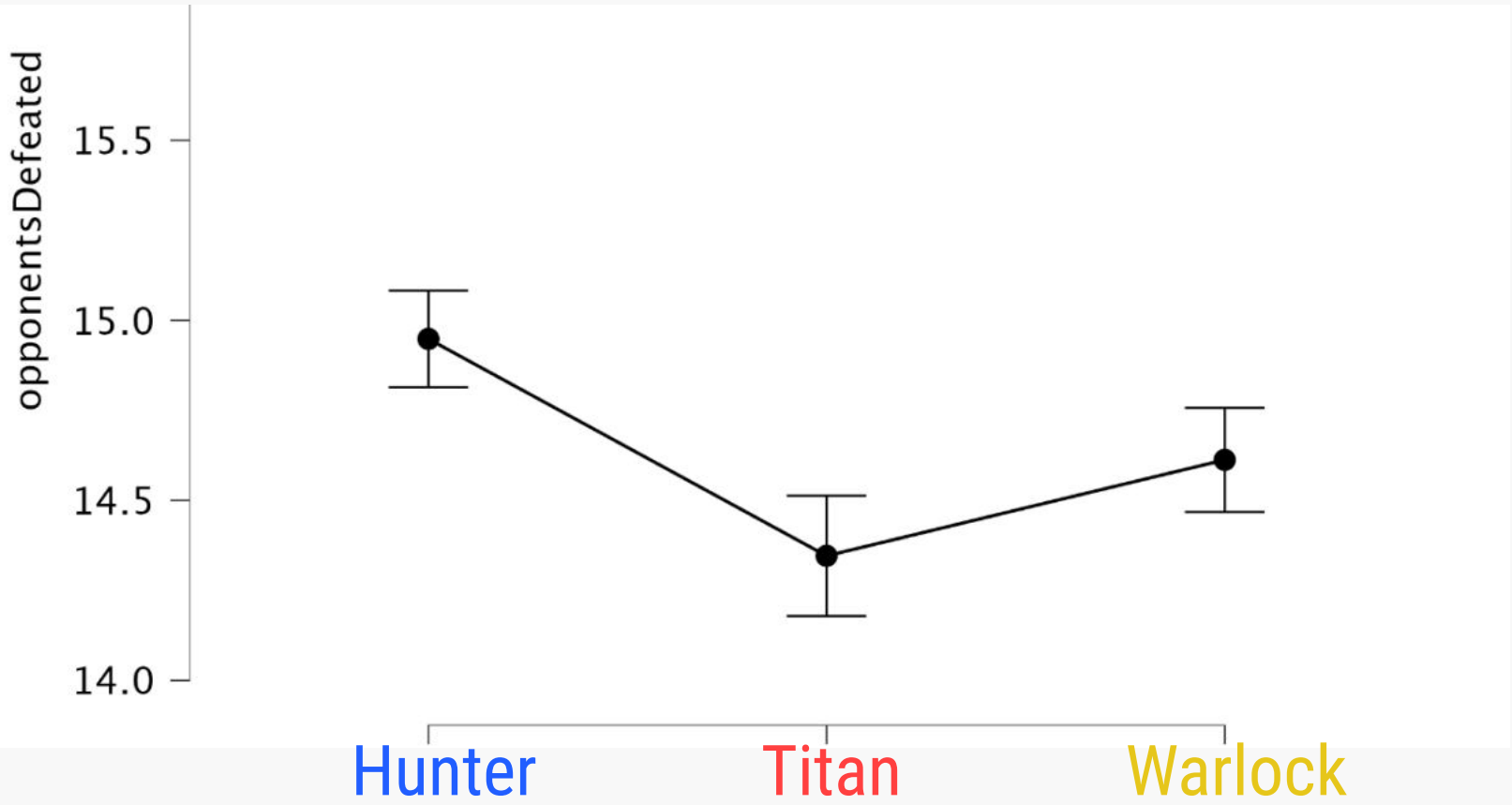
Standard

Post Hoc Comparisons – class

		Mean Difference	SE	t	Pbonf
Hunter	Titan	0.603	0.111	5.453	< .001
	Warlock	0.336	0.100	3.358	0.002
Titan	Warlock	−0.267	0.114	−2.331	0.059

Note. P-value adjusted for comparing a family of 3

Average number of opponents defeated per match



Interpretation

- This aligns with the inverse regarding the numbers of deaths. If Hunters are slaying, then the other classes die more.
- Hunters may have more tools that enable them to slay out more.

Thank you