**Pokemon Power Creep – A Statistical Analysis**

Ian Kim

**Abstract**

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Imagine creating a game that must remain compelling for 25 years. How would you continuously introduce new concepts to excite and engage new and returning players? This is the problem most game developers face. There are 2 ways developers solve this problem: Break the fundamental rules of the game or introduce elements that are more powerful and impactful things than the previous. While these approaches gives the audience a more compelling game, introducing overpowered characters or mechanics will only temporarily boost the excitement, and will often lead to a disruption in overall game balance. This phenomenon is called power creep.

To better understand the nature of power creep, lets look at a popular game, League of Legends. League of Legends is a MOBA (Multiplayer Online Battle Arena) where the main premise is to take down the enemy’s nexus. After about 10 years of development, Riot has released champions that have: the potential to revive teammates (Akshan), dashes and invisibility that reset on kills (Akshan, Aurora), 4 dashes in one ability (Bel’Veth), uncapped attack speed champion (Bel’Veth), dashes every time an ability is used (Ambessa), and a champion that has a dash that is an unstoppable, airborne, gives armour and magic resistance, and does damage based on the targets maximum health in one ability (K’sante).

Pokemon does not shy away from power creep either by continuing to introduce increasingly more powerful Pokemon through its stats, abilities and moves with each new generation. For instance, giving Zacian one of the best typings in the game – fairy and steel – and giving it great overall stats with an insanely broken ability, Intrepid Sword – giving it a +1 attack boost to Zacian every time it switches in. Similarly, Urshifu breaks the game mechanics by being the first Pokemon to be able to hit through Protect/Detect/Spiky Shield (without the move Feint) with the ability Unseen Fist. Furthermore, Urshifu’s signature moves – Wicked Blow and Surging Strikes – are guaranteed to critical hit, ignoring attack drops like Intimidate or defensive boosts, making typical ways of slowing down physical Pokemon ineffective.

With 25 years of development of Pokemon, this study intends to investigate has Gamefreak statistically avoided the power creep phenomenon that is present in most series-based games? To explore this, the following research questions are addressed: is there an overall increase in stats throughout the generations? Has there an increase in the number of “good to great” types per generation? How do we define a “good” or “bad” type? Is average base power of a Pokemon move affected by power creep? Do max base stats increase as the Pokemon series progresses?

**Methodology**

This study employs mainly quantitative data such as base stats of Pokemon, type chart, movebase power and accuracy, and the generation number to compare key metrics. Data in this study was mainly collected by *PokeAPI*, which is an API (Application Programming Interface) where data about any Pokemon or generation can be gathered. Additionally, the type effectiveness chart which outlines super-effectiveness, not-very-effective, and no effect was sourced through Kaggle, which is a platform for data scientists and data analysts to analyze a variety of different publicly available datasets created by users.

Given the entire dataset was forked through GitHub, there were extensive unnecessary data was required removal to ensure data relevancy. The necessary datasets were initially cleaned through the *clean.py* program, removing any empty cells in the csv. Then, data was further processed in an SQL database, and any unnecessary data was removed here. Within the *PokemonCompleteStats.xlsx,* additional columns were added to using SQL joins and Python such as Generation ID, base stat total, and Pokemon’s typing.

**Findings/Results**

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| Figure 1 represents the average base stat total per generation, sorted by highest base stat total per generation to lowest |

*Figure 1* illustrates the highest average base stat total per generation, with the top 3 being Generation 9 (Scarlet and Violet), generation 7 (Sun and Moon), and Generation 4 (Diamond, Pearl, Platinum), with the bottom 3 being generation 1 (Red, Blue, Yellow), Generation 2 (Gold and Silver), and generation 3 (Ruby, Sapphire, Emerald). Since some generations have more or less Pokemon, the introduction of weaker or stronger Pokemon could skew the dataset for that generation. For instance, in generation 6, there were 72 Pokemon introduced. Therefore, having Pokemon like Fletchling and Bunnelby can influence the average massively.

Generation 9 being at the top makes sense because generation 9 introduced paradox Pokemon, thus skewing the results heavily. About (find out how many pokemon were introduced in gen 9 and 24/gen 9 mons \* 100)

Generation 7 was a huge increase in generation 7 because with only 88 Pokemon being introduced in generation 7, 25 of them (28%) of them are either legendary or ultra beasts. This generation introduced so many ultra beasts, and they have the most amount of legendaries out of any generation

Generation 4 was a huge increase in generation 4 because of the amount of previous generation Pokemon that got an evolution in this generation – Ambipom, Mismagius, Weavile, Magnezone, Lickilicky, Rhyperior, Tangrowth, Electivire, Magmortar, Togekiss, Yanmega, Gliscor, Probopass, Dusknoir, Gallade, Porygon-z, Frosslass (naturally having much higher Base Stat total than their baby and 1st evolution counter parts)-- and the amount of legendries and mythicals in this generation compared to others – having the 3rd most amount of legendary and mythicals at 14. Though generation 4 has their fair share of baby Pokemon too, but the amount of Pokemon that got an evolution outweighs the baby Pokemon introduced in this generation such as: mantyke, bonsly, Mime Jr., Happiny, Chingling, and Budew, Riolu, Munchlax ; talk about the amount of mythicals and legendaries that were added in this generation too

Generation 2 and 3 are two lowest possibly because of the amount of baby Pokemon that were introduced in this game such as Pichu (205), Cleffa (218), Igglybuff (210), Togepi (245), smoochum (305), elekid (360), magby (365) and notoriously weak Pokemon such as Sunkern (180), Unown (336), Smeargle (250) , etc… There was a small dip in generation 3 because of having notoriously weak Pokemon such as Shedinja (236), Azurill (190), Feebas (200), Wynaut (260),Surskit (269), ralts(198), etc…

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| Figure 2 represents the median base stat total per generation |

-Used median to see if there would be a change in base stat total, compare and contrast to mean

-Relatively consistent, with the first 3 on both sides being their respective placements, but the middle is a bit jumbled

-Could be the large number of Pokemon introduced in gen 5 (156) skewing that

-Small number of Pokemon (72) in Pokemon X skewing that

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| Figure 3 represents the number of abilities introduced every generation |

* Having the most abilities in generation 3 makes sense because that was the first generation to have abilities
* But up until generation 5, I think that abilities have been relatively balanced
* For example, Huge power and pure power seem like really strong abilities [explain what they both do], but they are balanced around being given to Pokemon with giving it to Poekmon with low base stat in attack
  + Medicham has 60 base attack, so it turns into 120 base with pure power
  + Huge power is given to Azumarill (no megas), which has 50 base attack, so it turns into 100 with huge power, also given to Diggersby which has a base 56 attack, which 112 with pure power
  + In gen 6, these 2 moves were given to Mega Medicham and mega mawile, which medicham-m has 100 base attack, so it turns into base 200 base attack with pure power, and mawile has base 105 attack, and it turns into base 210 with huge power
  + To put how insane these stats are, the top 5 highest attack Pokemon are Mega Mewtwo-X (190), Heracross-mega (185), Kartana (181), Deoxys (180), Groudon-Primal (180)
* Intimidate, one of the best abilities in the game was introduced in generation 3, however it was balanced around giving to weaker Pokemon in the earlier generations like… until gen 7 (Incineroar <https://bulbapedia.bulbagarden.net/wiki/Intimidate_(Ability)#:~:text=Intimidate%20(Japanese%3A%20%E3%81%84%E3%81%8B%E3%81%8F%20Intimidate,Ability%20introduced%20in%20Generation%20III.)>
* In generation 3, Pokemon introduced speed boost, which is balanced around weak Pokemon having this ability. Up until generation 5, Pokemon with bad typings got the ability – Ninjask, Yanmega, Sharpedo, Scolipede
  + Then in generation 6, it was introduced to Blaziken and his mega which this Pokemon was so strong that it got instantly sent to ubers
  + Espathra, the newest Pokemon in gen 9 was also instantly sent to ubers with the speed boost ability
  + The other 4 Pokemon that were listed were never sent to ubers
* In generation 8, something never seen before was released. A pokemon’s ability that can hit through protect (urshifu with unseen fist).
* In generation 9, very notable abilities that were introduced that changed the game was the ruiniation abilities (Vessel of ruin, tablets of ruin, swords of ruin, and beads of ruin) which reduces a Pokemon stat (depending on ability) except itself by 25%
* In generation 8, one of the most broken Pokemon with the most broken ability was introduced, Zacian crowned. In generation 8, Zacian-crowned had a base attack of 170 AND it had an attack that increases 50% of the original stat (<https://bulbapedia.bulbagarden.net/wiki/Stat#Stages>)
* In generation 9, zero to hero was introduced, a move that increases a Pokemon’s stats by 193 by just switching out once

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| Figure 4 represents the average base power between damage classes (physical/special) per generation |

-There doesn’t seem to be any correlation between moves and their base power over generations

-Does not account for certain moves (PUT MOVES EXLUDED IN APPENDIX)

-Makes sense because most of the moves introduced in earlier generations are ‘staples’ like Tackle or pound or hydro pump or draco meteor

-Seems that later generations introduced more signature moves or niche/utility moves (List Some https://bulbapedia.bulbagarden.net/wiki/List\_of\_moves)

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| Figure 5 represents a column heatmap of the max base stats per generation |

* Represents the max Base stats, attack, defence, HP, special attack, special defence, and speed
* The earlier generations have higher stats, however they are held back by their other stats
* Show certain Pokemon (chansey or blissey or Shuckle)
* However, Pokemon with a bit less base stat in later generations are more balanced (Regidrago, Regileki, Ultra beasts, Zacian)

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| Figure 6 represent the ranking of typing’s based on offensive and defensive capabilities |

* Calculated based on a score, offensive and defensive values of a type using *RankAlgorithm.py*
* Offensively, No effect giving a -2, super effective giving +2, not very effective giving -1, and neutral attack giving +1
* Defensively, neutral giving +1, not very effective giving +1, super effective giving -2, no effect giving +2
* Average score is adding the offensive score + the defensive score divided by 2
* Grass and bug are the weakest types, with the most resistances and weaknesses?
* Surprisingly, ghost is the “best” type, surpassingly because ghost isn’t known to be a very defensive typing
* Steel and dragon being middling typing’s is surprising too since they are known to be great typing’s

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| Figure 7 represents the weighted average of typings based on how many Pokemon of a certain type were introduced in that generation |

* Multiplied average score of types by number of types in that generation divided by the number of pokemon in that generation to get the weighted average of that generation
* Talk about gen 9 being on top, and gen 8 being at the bottom
* Talk a little bit about gen 6 being so low
* Why certain generations could’ve been affected by the introduction of the fairy typing
* Discussion
  + Implications
    - Statistically, there is little to no correlation between generation introduced and power creep
  + Limitations + further research opportunities
* Conclusion
  + Summary of findings
  + Significance
  + Final remarks
* References
  + PokeAPI
  + Kaggle dataset