**Is Power Creep Real?**

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**Abstract**

Is Power Creep Real?

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). In contrast, the bottom 3 being generation 1 (Red, Blue, Yellow), Generation 2 (Gold and Silver), and generation 3 (Ruby, Sapphire, Emerald). Generational disparities can be attributed to many factors such as amount of legendaries, ultra beast, mythical, paradox, and evolution of older Pokemon. In Generaiton 9, with the introduction of paradox Pokemon, 25.83% of Pokemon in generation 9 are paradox, legendary or mythical. For example, in generation 4 high average reflects evolutions from previous generations like Togekiss and Electivire. In generation 6, there were 72 Pokemon introduced. Therefore, having Pokemon like Fletchling and Bunnelby can influence the average massively.

Generation 4 experiences a notable increase in base stat Pokemon because many older Pokemon received their new evolutions – Ambipom, Mismagius, Weavile, Magnezone, Lickilicky, Rhyperior, Tangrowth, Electivire, Magmortar, Togekiss, Yanmega, Gliscor, Probopass, Dusknoir, Gallade, Porygon-z, Frosslass – which’ll have naturally higher base stat totals than their pre-evolution counter parts. Pokemon Diamond, Pearl, Platinum ranks 3rd of having the most amount of legendaries and mythicals at 14. Though generation 4 has their fair share of baby Pokemon too – Mime jr. Mantyke, Happiny, Chingling, Budew, Riolu, and Munchlaw – the impact of these weaker Pokemon was offset by the abundance of legendary Pokemon, mythicals, and 2nd and 3rd stage evolutions.

Generation 2 and 3 are among the two of the lowest base stat totals due to 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), Shedinja (236), Azurill (190), Feebas (200), Wynaut (260), Surskit (269), ralts(198), etc…

Generation 3 in particular have an abundance of early-game Pokemon -- Wurmple line, Lotad line, Ralts line, Ziggzagoon line, Wingull line, and Poochyena line. This generation also introduced standalone Pokemon with low base stat totals like Spinda (60)

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| Figure 2 represents the median base stat total per generation |
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*Figure 2* illustrates the minimum median base stat total per generation to compare and contrast a central tendency to a mean. The median for the top 3 are in order by generation, but the middle of the bar chart is a bit jumbled. These numbers could be a bit jumbled because the largest number of Pokemon were introduced in generation 5 (156), possibly skewing the information whereas Pokemon X introduces a small number of Pokemon (72), possibly skewing that generation.

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

*Figure 3* represents the number of abilities introduced in every generation. Generation 1 and 2 have no abilities because abilities were introduced in generation 3, making it the generation with the most amount of abilities. The number of abilities introduced in each generation does not matter, so there is no quantitative way of measuring abilities. However, all abilities are not equal, some abilities will be better than others. Up until generation 5, abilities have been relatively balanced. For example, Huge Power and Pure Power are two really potent abilities that was introduced in generation 3,but they were balanced around being given to Pokemon with a low base stat in attack. Medicham, a Pokemon that was introduced in generation 3, has 60 base attack, so it turns into 120 base attack with the pure power ability. Azumarill, a Pokemon that was introduced in generation 2, has 50 base attack, so with huge power, it turns into 100 base stat total. However, in generation 6, 2 mega Pokemon were given huge power Medicham and Mawile. Medicham-M has a 100 base attack, turning into 200 base attack with pure power, and Mawile-M has 105 attack, and it turns into 210 base attack with huge power. To put it into perspective of how insane these stats are, the top 5 highest attack Pokemon without any abilities are: Mega Mewtwo-X (190), Heracross-M (185), Kartana (181), Deoxys (180) and Groudon-Primal (180).

In generation 3, Pokemon introduced the Speed Boost ability, which was balanced around weak Pokemon having this ability – Ninjask, Yanmega, Sharpedo, and Scolipede. Then in generation 6, it was introduced in Blaziken alongside his mega, which this Pokemon was perceived as so strong that it instantly got sent into Ubers tier on Smogon. To illustrate how broken this ability is given to a mediocre Pokemon, let’s look into Espathra. Espathra’s stats are not anything very impressive, mediocre, however this ostrich Pokemon was instantly sent to ubers in Smogon. However, the 4 Pokemon listed above was never sent to Ubers tier, the tier for legendaries.

In generation 8, something never seen before was released, a Pokemon’s ability that can always hit through Protect -- Urshifu with the Unseen Fist ability. This ability breaks the fundamental concept of the game because Protect is a move that should always guarantee the Pokemon that utilizes it does not get hit (aside from the move Feint, but that move is so niche and I personally have never ever seen that move used). Another Pokemon that was introduced in generation 8 that was undeniably broken was Zacian-crowned, which has the ability Intrepid Sword and a base attack stat of 170. Intrepid Sword increases Zacian’s attack stat by 50%, and not to mention the insanely broken Fairy and Steel typing. This ability was so broken that it had to be nerfed in generation 9 that on first switch in, Zacian will increase its attack stat by 50%.

In generation 9, there were broken abilities that changed the game, the runination ability – Vessels of Ruin, Tablets of Ruin, Swords of Ruin and Beads of Ruin, which reduces the X (depends on ability) stat of all Pokemon on the field except itself by 25%. Another ability, Zero to Hero was introduced, which is an ability that increase a Pokemon’s stat by 193 by just switching out once. These abilities only scrape the surface of broken abilities that were introduced in newer generations, and how supposedly broken abilities were balanced in earlier generations, and how these same abilities were given to great Pokemon, making them broken.

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

*Figure 4* represents the average base power between damage classes, and examine if there is a correlation between an increase in base power with physical or special moves per generations. This figure does not account for certain moves, see *Appendix 1*. There doesn’t seem to be any correlation between moves and their base power over generations. Most of the moves introduced in earlier generations are ‘staple moves’ or ‘common moves’ such as Tackle or Pound for early game or Fire Blast, Hydro Pump, Draco Meteor, thus the first 2 generations resulting in lower physical and special moves. It seems that later generations introduced more signature moves or niche/utility move. In generation 9, 64 moves were introduced in generation 9, and 87.5% of moves are signature.

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

*Figure 5* represents the max base stats (of attack, defence, hit points, special attack, special defence, and speed) per generation. This heatmap showcases in earlier generations have higher stats, however they are held back by their other stats. For example, Blissey, a Pokemon introduced in generation 2, has the max HP stat of 255, however Blissey is balanced by having low attack, defence , speed , and special attack, and any physical attack will do a great deal of damage. Looking at the generation 8 Pokemon with 200 HP, Regidrago. Though Regidrago has 55 less stats in HP, but it has more balanced stats. The same could be said for Alomamola, the Pokemon with a 165 HP, its stats are more well-rounded even though Alomamola have 70 less base stats. Neither of these Pokemon have 10 defence and 10 attack, which provides a huge liability for the Pokemon. *Appendix* 2 showcases the base stat totals between Blissey, Regidrago, and Alomamola. A Pokemon with 10 attack is Magikarp.

The Pokemon with the highest defence and special defence stat is Shuckle, which has 230 in both defence and special defence. However, its other stats are pitiful, with Shuckle’s HP at 20, Attack at 10, Defence at 10, Speed at 5. A Pokemon high defence stat in Generation 9 is Pecharunt at 160. However, unlike Shuckle, Pecharunt has 88 base stats for all other stats aside from defence, making it much more usable than Shuckle.

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

*Figure 6* represents the typing based on offensive and defensive capabilities using *RankAlgorithm.py*. It calculates an offensive and defensive score based on the type effectiveness depending on how it interacts with other types. I gave a score based on as follows:

* Offensively: No effect giving a -2, super effective +2, not very effective -1, and neutral attack +1
* Defensively: neutral +1, not very effective +1, super effective giving -2, no effect +2.

Average score is adding the offensive and defensive score then divided by 2. As shown on the graph, grass and bug type Pokemon are the weakest type with the most resistances and weaknesses. Surpassingly, ghost has the highest average score because ghost isn’t known to be a very defensive typing, but a more offensive typing. Steel and dragon types being middling typings is surprising too since they are 2 types known to be great typings, with a great amount of Pokemon.

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| Figure 7 represents the weighted average of typing 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**

Statistically speaking, there is little to no correlation between generation introduced and power creep. However, there is a reallocation of stat spreads which makes Pokemon seem stronger. For example, there are more balanced Pokemon rather than speicalized Pokemon like Blissey or Shuckle. With a bit less base stat total in some stats, some of these Pokemon are stronger and have more usage than Shuckle or Blissey. However, looking at abilities from the pure eye test, and the different Pokemon that gets abilities in future generations showcases that there has been power creep.

Within the research, there were a few limitations such as determining type effectiveness. Counting type effectiveness does not account for untangibles for a Pokemon such as**[FILL OUT].** Further research opportunities could be **to [FIND OUT TYPE EFFECTIVENESS IDEAS],** or does having Legendary, Mythical, Ultra Beasts, and Paradox Pokemonis a driving force behind power creep, and how do the non-legendary Pokemon compare to non-legendary Pokemon in terms of base stat total and how does legendary Pokemon compare to legendary Pokemon in terms of base stat total. Another research question idea is does average evolution stage affect the average base stat total per generation? Within this research question, I would into average stage of each generation and look at average base stat total for each stage of pokemon per generation.

* Conclusion
  + Summary of findings
  + Significance
  + Final remarks

**Appendices**

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| Appendix 1:   1. These moves are very strong "one time moves" or "you can use for 3 turns" (Z-Moves & Dynamax + Gigantamax moves) and will skew the results 2. Moves that are calculated based off "something", because the base power (or fixed damage) is variable 3. Some moves are not useable ingame (like eternabeam, light of ruin) 4. Fixed damage does not equal base power   Moves that were excluded:   * z-moves, dynamax moves, eternabeam,return,frustration,gyro ball,wring out, counter crush grip, electro ball, OHKO (One Hit KO) [fissure, horn drill, sheer cold,guillotine],sonic boom, low kick,seismic toss,dragon rage, fissure, night shade, bide, psywave,super-fang, flail,reversal,present,magnitude,mirror-coat, beat-up,spit-up,endeavor,natural-gift,metal burst, fling, trump card,punishment, grass knot,heavy slam, final gambit, heat crash, pika papow, veevee-volly |

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| Appendix 2:  Blissey stats: |
| Alolmamola stats: |
| Regidrago stats: |

**Works Cited**

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