Avoid The Virus Game Balance Doc

For game balance, we'll be balancing enemy damage reduction and damage onto player multipliers. These values are used for the combat system. When player and enemy stats are calculated, damage is calculated by:

(Pseudocode, formula could be changed)

$$enemy.HP = enemy.HP - player.attack\_base\_dmg * \frac{player.damage\_multiplier}{enemy.damage\_reduction}$$

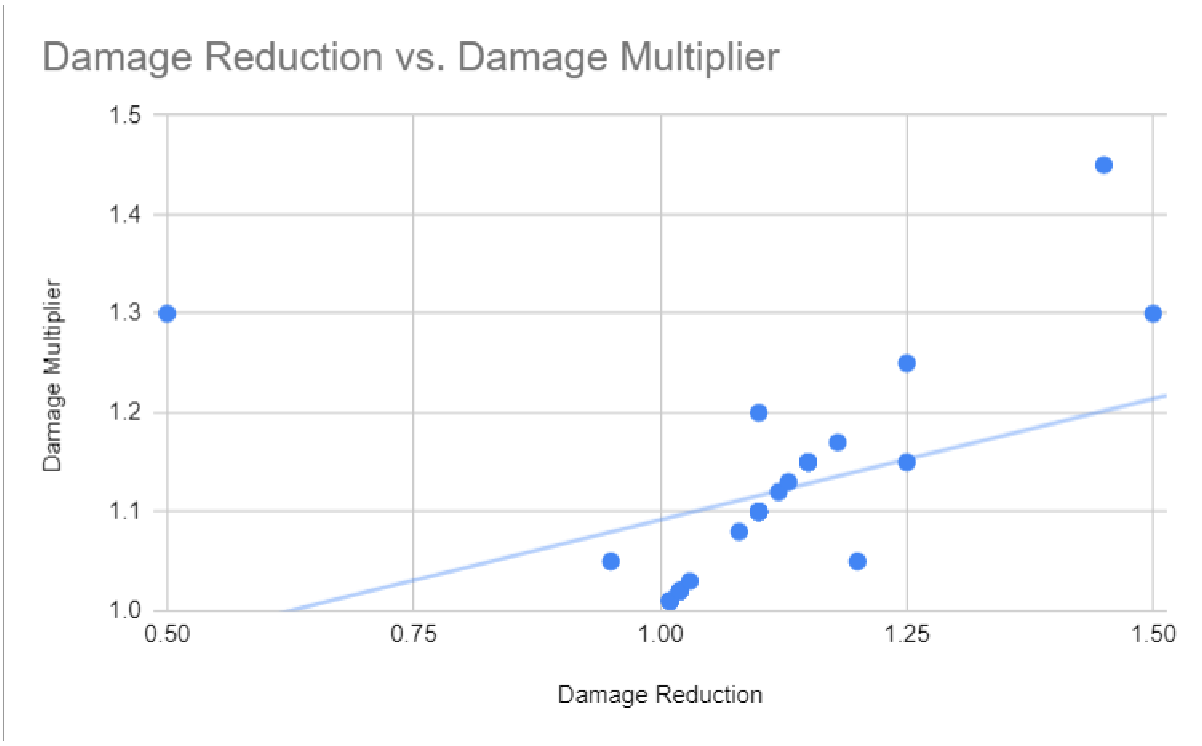
If we are updating enemy hp, then the attack base damage and damage multiplier would come from the player stats, whereas the damage reduction would come from the enemy stats. These multipliers are, in a way, a representation of attack and defence stats for fighters. We would need both these stats to have the capabilities for more offensive or defensive enemies in battle as the game progresses and enemy stats have to continuously be padded for game difficulty.

Here are the initial numbers for the game's enemies sorted by increasing damage reduction values:

Damage Reduction	Damage Multiplier
0.5	1.3
0.95	1.05
1.01	1.01
1.01	1.01
1.01	1.01
1.01	1.01
1.02	1.02
1.02	1.02
1.02	1.02
1.02	1.02
1.03	1.03
1.08	1.08
1.1	1.1
1.1	1.1
1.1	1.1
1.1	1.1
1.1	1.1
1.1	1.1
1.1	1.2

1.12	1.12
1.13	1.13
1.15	1.15
1.15	1.15
1.15	1.15
1.15	1.15
1.18	1.17
1.2	1.05
1.25	1.25
1.25	1.15
1.45	1.45
1.5	1.3

Here's a graph of how damage reduction values match up with their damage multiplier counterparts for enemies.



From this given graph and the slope value of 0.245 * x, we can presume that damage reduction increases faster than damage multiplier. We chose this due to this game being a turn-based RPG for combat. Generally, in other turn-based combat games, battles can take a substantial amount of time. This is partially due to HP values for enemies increasing faster than damage. Although we have hp multipliers as well as damage reduction multipliers for enemies, we chose to mainly use damage reduction as the scaling defensive enemy stat, so most enemies could have a standard amount of 100 health points, potentially making graphics and calculations easier for the game. If damage dealt by enemies were to creep up, then battle times would decrease farther into the game. Although this would be a good change up in rare encounters, damage creep tends to not be the norm in turn-based combat. We do not want players to have their game end immediately if they make one singular bad decision.

As an example of a battle scenario, let’s calculate what could happen to a player fighting an early-game enemy and then a late-game enemy.

Early game scenario:
The normal starting enemies have 1.01 damage reduction and damage multipliers. The player has 3 attacks: punch, shoot, and heat; each doing 25, 50 and 75 damage respectively. This information is not given to the player, therefore, we can assume the player will not play optimally at the beginning and maximise the amount of damage onto the enemy. If we take the average of a random attack the player chooses, where each option has an equal chance of being picked, the player will do 50 damage on turn 1. The enemy can attack back with either a 15 damage attack or a 20 damage attack; we’ll take an average of 17.5 damage per attack then. Given the damage reduction and damage multiplier of this early game virus, the player will 3-hit kill the enemy: $100 - 3 * 50 * \frac{1}{1.01} <= 0$, whereas the enemy would 6-hit kill the player assuming the AI only attacks: $100 - 6 * 17.5 * \frac{1.01}{1} <= 0$. This situation may be too easy, but since this is the beginning of the game, this should be acceptable. There’s a lot of new parts of the game at the beginning and battles should not immediately require too much knowledge and decision-making from the player.

Late-game scenario:
A late game enemy that isn’t at the very end would have 1.25 damage reduction and 1.25 damage multipliers. If we are excluding items in calculations and the player is still doing an average of 50 damage per turn, then the player will still 3-hit kill the enemy: $100 - 3 * 50 * \frac{1}{1.25} <= 0$. The enemy would 5-hit kill the player with previous assumptions: $100 - 5 * 17.5 * \frac{1.25}{1} <= 0$. A 5-hit kill onto the player may be a bit too generous for the player, especially as the player still defeats the enemy in 3 strikes with random choices. Upon analysing all the variables in combat, the first thing that sticks out as requiring a fix would be to lower the variance and magnitude in damage of player attacks. Heat being a staggering 75 points of damage is extremely high compared to punch, which would be a mere third of its damage. Decreasing the average of a player attack to perhaps 30 points of damage would make battles a lot closer in the late game, while also still remaining comfortably in player’s favours in the early game. $100 - 5 * 30 * \frac{1}{1.25} <= 0$. The player would defeat the late game enemy in this example in 5 random attacks, which would be almost even compared to the enemy’s odds. $100 - 4 * 30 * \frac{1}{1.01} <= 0$. From this calculation, a player could still defeat early game enemies in 4 hits, which would still be a lot faster than the enemy could.

Notes:
Items and other options for the player to increase/decrease stats were not taken into account for this game balance analysis, since these features were not implemented at the time. More variables such as specific enemy weaknesses and specific attack effectiveness would also make game balance more interesting, as the possibilities for intricate decision making would increase.