

Note:

The following is meant to be ‘throwing a nuke’ at a simple problem, just to make sure our intuition is correct about when to value Vitality vs Toughness. Even though this is semi silly in its overkill, with combat logs or good approximations for expected DDPS, DoT, and HPS in a given fight, we could get pretty accurate results for the ratio at which you should try to keep your Toughness and Vitality stats. If you don’t care about math, just read the first part where I describe what each variable name means then skip to the end.

When determining if one stat is more valuable than another, consider what the stats do and see how changing them affects any values you care about. Toughness reduces Direct Damage you take. Vitality raises your max health, which makes you able to take more total damage before you die.

StD - Seconds til Death :p. This is what we’re going to want to maximize (ie, live longest we can) and see how changes in Toughness and Vitality relatively effect changes in Seconds til Death.

DDPS - the total Direct Damage Per Second you are taking (ie, DMG able to be mitigated)
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NOTE: $\text{Damage} = \text{Ability_Coeff} * \text{Weapon_Str} * \text{Power} / (\text{Armor} + \text{Toughness})$ is how we’re thinking Dmg is calculated, but for the numerator (the ‘top’ of the equation) we don’t really care about each term when calculating the effectiveness of Toughness/vitality, so DDPS is just the Numerator of the Damage equations (taken per second). This allows us to simplify
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DoT - Damage over Time (per second) taken from conditions (not able to be mitigated)

HPS - Healing Per Second that you roughly expect to see (self/incoming heals, life steals, etc)

BA - Base Armor, depends on class. Total armor is increased 1:1 with Toughness

BH - Base Health, depends on class. Total Health is increased by 10 for every 1 Vitality

Toughness and Vitality - What we would gain from gear/trait type choices

Note: I’m not making notation for boons/conditions that affect Tough/Vit, but they are encompassed by the “Toughness” and “Vitality” variables.

$$[\text{DDPS}/(\text{BA} + \text{Toughness}) + \text{DoT} - \text{HPS}] * \text{StD} = \text{BH} + 10 * \text{Vitality}$$

Left Hand Side is total net damage taken, over a ‘period of time’. Equating the Left side with the Right hand side, which is the total health, makes that ‘period of time’ the time it takes to damage the full health bar (ie death/downed state) and gives us our **StD** stat.

Now, to find out the relative effects of Toughness and Vitality on StD you take the derivative of StD with respect to the terms and then we'll compare them. After some algebra, you get:

$$dStD/dVitality = 10/[DDPS/(BA + Toughness) + DoT - HPS]$$

$$\begin{aligned} & dStD/dToughness \\ &= (BH+ 10* Vitality) * DDPS / [DPS/(BA+Toughness)+DoT-HPS]^2 \\ & *(BA+Toughness)^2] \end{aligned}$$

now we need to compare the two.

What we want to know is for what values the derivatives are greater/less than each other. If for a given set of values (of BH, BA, DoT, HPS, etc.) one derivative is greater, that stat is better given those values.

so comparing $dStD/dVitality$ **vs** $dStD/dToughness$

is the same as

$$10 \text{ vs } (BH+10*Vitality) * DDPS / [DPS/(BA+Toughness)+DoT-HPS]^2 *(BA+Toughness)^2]$$

is the same as

$$10*[DDPS(BA+Toughness)+(DoT-HPS) *(BA+Toughness)^2] \text{ vs } (BH+10*Vitality) * DDPS$$

you can make whatever simplifications you want from there. On the show I looked at the initial decision, the one when Toughness and Vitality both = 0 (ie, you haven't picked any gear/traits). This simplification allows us to reduce to the semi intuitive:

$$10*(DoT - HPS)/DDPS \text{ vs } (BH - 10*BA)/(BA^2)$$

If the Left Hand Side is bigger => Vitality is more valued

If the Right Hand Side is bigger => Toughness is more valued

You can even make further simplifications if BA and BH are related. In the necro's case I think $BH = 10 * BA$.

What have we gained?

If you're getting hit relatively more by Direct Damage, toughness is more valuable.

Getting a lot of healing/regen and/or good condition removal, toughness is again more valuable.

If you're hit by relatively more Condition dmg, Vitality is more valuable.

> Usually don't completely stack either Tough/Vit as their effectiveness increases with each other. You want them to be in a ratio. So if there is a certain trait tree, say that enhances Toughness, that you want to go down for the utility, getting Vitality gear might make sense.

Again, if you have good approximations for expected DPS, HPS, and DoTs for any given fight, you could come up with good ratios. You can sort of do this by looking at the death log. Another way to approximate is to figure out what percentage of members of other teams are running Condition/DoT builds vs the percentage that is running Direct Damage builds.

“Toughness is worthless”?

If you look at the equation about your initial choices in traits/gear with no added Tough/Vitality yet:

$$10 * (DoT - HPS) / DDPS \text{ vs } (BH - 10 * BA) / (BA^2)$$

If $DoT < HPS$, ie. you're not getting hit by a lot of Conditions, you have high healing, or a lot of condition removal, Then the left hand side of the equation is always negative... Simply, Toughness will always be more valued (if $BH \geq 10 * BA$ or close to it) which it is close for a few classes like necros.

There are clearly more situations where Toughness is more valued, this is a simple way to 'prove' that there are very normal situations where Toughness is a ton more valued than Vitality.