Journal of Interdisciplinary Science Topics

When Science Collides with Gameplay: Reinhardt's Charging Force

Freddie McCann

Natural Sciences (Life and Physical Sciences), School of Biological Sciences, University of Leicester 14/03/2025

Abstract

In the game Overwatch, Reinhardt is a trusty tank who has a charge ability enabling him to use thrusters to hurtle towards his enemies. This paper estimates his mass using another character's known weight, as well as comparing the mass of his armour against medieval armour. Using this the force, momentum and kinetic energy can be calculated of his charge.

Keywords: Computer Game; Physics; Kinetics; Overwatch; Reinhardt

Introduction

In Overwatch, Reinhardt (as seen in Figure 1a) stands as a towering tank hero, offering both protection and strength on the battlefield. Standing at an impressive 7'4", Reinhardt wears his iconic Crusader armour. Armed with his signature Rocket Hammer, he can deliver crushing melee attacks, while his deployable energy shield provides protection for his allies. One of Reinhardt's most impactful abilities is his charge (as seen in Figure 1b), where he drives himself forward with incredible force, pinning enemies in his path, slamming them into walls to deliver devastating damage. [1].



Figure 1 – (a) An image of Reinhardt from the game Overwatch [2]. (b) An image showing Reinhardt using his charge ability [3].

This paper will examine the plausibility of Reinhardt's Charge ability by analysing his estimated mass and velocity during the manoeuvre. His total mass will be determined through a comparison to Roadhog's build, and the weight of historical medieval knight armour. Using these calculations, the study will explore the estimated velocity Reinhardt achieves during his charge. This paper will also determine the momentum and impact force generated during the charge, providing insights into how powerful the charge is.

Mass of Reinhardt

Reinhardt's base body mass without equipment is approximated at 226 kg (500 lbs). This assumption stems from comparisons to Roadhog's weight, given their similar height [4] it can be assumed they are of similar mass, and the known mass of Roadhog can be used for Reinhardt [5]. Additionally, Reinhardt wields his signature Rocket Hammer, with an estimated mass of 27 kg (60 lbs) [6], adding significant mass to his total.

For the purpose of this paper, his crusader armour will be compared to 15th-century medieval plate armour, with a typical mass between 20-25 kg (44-55 lbs) [7]. However, accounting for Reinhardt's larger-than-average size, standing at 7'4", and the visibly bulkier nature of his armour, we estimate an additional increase in mass of approximately 40 kg (88 lbs), due to the increased height, material thickness, and technological additions.

Combining these values:

- Base body mass: 226 kg
- Rocket Hammer mass: 27 kg

 Crusader armour mass: 65 kg (25 kg base + 40 kg adjustment)

This brings Reinhardt's estimated total mass to 318 kg (700 lbs).

Velocity Calculation

To find the average velocity of Reinhardt during his charge ability we must use an equation to calculate velocity using information from Figure 2.



Figure 2 – An image showing stats of Reinhardt's charge ability [2].

This would be:

$$v = \frac{displacement}{time},$$
$$v = \frac{50.2}{3} \approx 16.73 \, ms^{-1}.$$

Therefore, Reinhardt's average velocity would be 16.7 ms⁻¹. the knockback speed is not incorporated in this calculation as it is referring to the speed of which

the character not fully pinned by the charge move undergoes.

Impact force

To be able to calculate the impact force when Reinhardt pins another character to a wall, we must work out his momentum to then be able to work out his impact force [8]:

$$p = mv$$
,

where p is momentum (kgms⁻¹), m is mass (318 kg) and v is velocity (16.7 ms⁻¹). Therefore:

$$p = 318 \times 16.7 = 5310.6 \, kgms^{-1}.$$

Using 5310.6 kgms⁻¹ as the momentum, the impact force can be used using [8]:

$$F=\frac{\Delta p}{t},$$

where *F* is impact force (N), Δp is the change in momentum, assuming Reinhardt comes to a stop upon impact (5310.6 kgms⁻¹) and *t* is the impact time (0.5 s). Therefore:

$$F = \frac{5310.6}{0.5} = 10621.2 \, N.$$

Using an impact time of 0.5 s from Figure 2 the impact force from Reinhardt's charge is roughly 10621 N.

Conclusion

In conclusion, the analysis of Reinhardt's Charge ability provides a detailed estimation of its plausibility within the constraints of real-world physics. With an estimated total mass of 318 kg and a calculated velocity of approximately 16.7 ms⁻¹, the resulting momentum and impact force of the charge highlight its immense destructive potential. The momentum of 5310.6 kgms⁻¹ and an impact force of 10,621.2 N demonstrate the impressive power Reinhardt can cause during his charge, reinforcing its devastating effectiveness in gameplay scenarios.

References

- [1] Blizzard Entertainment (2016) Overwatch, [Computer game], Blizzard Entertainment.
- [2] Fandom (2020) Reinhardt. Wiki page. [Online] Available at: <u>https://overwatch.fandom.com/wiki/Reinhardt?form=MG0AV3#Weapons & Abilities</u> [Accessed: 4 March 2025]
- [3] Rossi, M. (2017). Updated: Reinhardt fixes and other Hero changes on the Overwatch PTR. [Online].
 Available at: <u>https://blizzardwatch.com/2017/07/14/hero-changes-overwatch-ptr/</u> Accessed: 4 March 2025]
- [4] NoMembership4 (2019) Overwatch Characters Heights, Weight Estimates, and More. Reddit [Online]. Available at: <u>https://www.reddit.com/r/Overwatch/comments/avewaj/overwatch_characters_heights_weight_estimates_and/</u> [Accessed: 3 March 2025]
- [5] EpsilonKey14 (2018) Reinhardt Weighs More Than Roadhog. Forum comment. [Online] Available at: <u>https://us.forums.blizzard.com/en/overwatch/t/reinhardt-weighs-more-than-roadhog/119217/2</u> [Accessed: 3 March 2025]
- [6] Dorn, J. (2024) *Reinhardt's Rocket Hammer Weighs 60 Pounds*. Expert Beacon. [Online] Available at: https://expertbeacon.com/how-heavy-is-reinhardts-hammer/ [Accessed: 3 March 2025]
- [7] Reitzer, L. (2023) The Weight Of Medieval Armor Mail, Plate, and Jousting Armor. Blog. [Online] Available at: <u>https://neutralhistory.com/the-weight-of-medieval-armor-mail-plate-and-jousting-armor/?form=MG0AV3</u> [Accessed: 3 March 2025]
- [8] Mochrie, S. & De Grandi, C. (2022) Force and Momentum: Newton's Laws and How to Apply Them, in: Introductory Physics for the Life Sciences, Undergraduate Texts in Physics. Springer, Cham. pp 37-130. DOI: 10.1007/978-3-031-05808-0_2