

# Petr Yan vs. Merab Dvalishvili:

## Mathematical Modeling

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*This document provides the formal mathematical structure underlying the Yan vs. Merab analytical breakdown. The models are designed to illustrate structural leverage mechanisms within the fight rather than predict exact outcomes.*

### Expected Net Control Minutes Differential

$$E[\Delta \text{ Control}] = E[\text{Control\_Merab}] - E[\text{Control\_Yan}]$$

This expression models the Expected Net Control Minutes Differential, which measures the number of additional minutes of positional control Merab is expected to accumulate relative to Yan. This is the structural hinge of the fight.

### Expected Merab Control Time

$$E[\text{Control\_Merab}] = \min(T, r \cdot T \cdot p \cdot (c / 60))$$

This expression models how Merab's expected control time equals his takedown attempt rate multiplied by fight duration, multiplied by his success rate, multiplied by the average control seconds generated per successful takedown. This represents wrestling pressure turning into positional leverage.

### Expected Yan Control Time

$$E[\text{Control\_Yan}] = \alpha \cdot E[\text{Control\_Merab}]$$

This expression models Yan's expected control time as a share of total control in this matchup, where  $\alpha$  reflects how control has historically balanced between them.

### Strike Suppression

$$\text{Strike Suppression} = 1 - (E[\text{Yan\_Strikes}] / (s_0 \cdot T))$$

Strike suppression measures how much Yan's expected output is reduced relative to his baseline striking rate.

### Expected Yan Strikes

$$E[\text{Yan\_Strikes}] = s_0 \cdot T \cdot (1 - k_{\text{threat}} \cdot (r \cdot p)) \cdot (1 - k_{\text{control}} \cdot (E[\text{Control\_Merab}] / T))$$

This expression models Yan's expected strikes as Baseline Output multiplied by a Threat Adjustment and a Control Adjustment. The Threat Adjustment captures stance tightening, level-change reactions, and pacing compression: as takedown attempt rate and success rate increase, perceived wrestling threat rises, reducing Yan's freedom to strike. Threat calibration is anchored to Yan–Merab I, the clearest empirical example of measurable wrestling-induced suppression, and is treated as matchup-specific rather than universally estimated. The Control Adjustment captures the mechanical reduction in striking opportunity when Yan's opponent is in positional control. In this model, if Merab controls 30% of total fight time, Yan's baseline striking opportunity is reduced by approximately 30%.

# Variable Definitions & Computations

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## Independent Variables

$r$  = Merab's takedown attempts per minute

$p$  = Merab's takedown success rate

$c$  = Merab's average control seconds per successful takedown

## Static Parameters

$T$  = 25 minutes (5 rounds)

$\alpha$  = Yan's historical share of total control time in his two head-to-head fights with Merab

$k_{\text{threat}}$  = Threat suppression coefficient

$k_{\text{control}}$  = Control suppression coefficient

$s_0$  = Yan's strikes landed per minute when wrestling pressure/control is relatively low

## Parameter Computations

$$\alpha = (C_{y1} + C_{y2}) / ((C_{y1} + C_{y2}) + (C_{m1} + C_{m2}))$$

$$k_{\text{threat},m} = (1 - (S_m / (s_0 \cdot T_m))) / (r_m \cdot p_m)$$

$$k_{\text{control}} = 1$$

## Model Assumptions

Control time cannot exceed the total fight duration.

Control suppresses strike opportunity proportionally.

Threat suppression is modeled linearly in  $(r \cdot p)$ .

Historical  $\alpha$  is used as a structural baseline.

The model estimates leverage, not win probability.

Threat suppression is calibrated exclusively from Yan–Merab I and treated as matchup-specific rather than universally estimated.